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VIEWS, NEWS AND INTERVIEWS.

A correspondent of a Canadian paper reports the following interview at Dunnville, Ont, which goes to show that even bright lights of the church are sometimes not above attempting to shine in "borrowed" light at the expense of the electric light company: "Where's the boss?" I asked as I strolled into J. H. Rowe's store at Dunnville. "Up at the Baptist church." was the reply. And feeling that as the mountain was unlikely to come to Mahomet, Mahomet would have to repair to the mountain, I wended my way to church (?). After greeting me, and in reply to my query, "What are you doing?" he said: "I think I am one too many for the electric light company. I am interested considerably in church work, and wanting to light up the basement of our church with the incandescent light, I asked the company if they would make any reduction in price charged for arc light in church. Being answered in the negative, I racked my brain for a scheme to get ahead of them, and finally struck upon the plan of making a hole through the floor. And on Wednesday and Friday nights the arc light above us can be lowered into the basement, and now we will get three nights' light for 50 cents per week instead of one."

Col. John Jacob Astor attended the meeting of the Western Union directors in New York city on September 14. Mr. Russell Sage, for the first time in his experience, arrived too late to collect the usual director's fee.

One of the most popular of the foreign military attachés who accompanied the army to Cuba was Capt. Arthur H. Lee, of the British Royal Artillery. He was always conspicuously at the front, and his account of the fighting of "The Regulars at El Caney," in the October *Scribner's*, is a valuable contribution to the permanent history of the war. Of the conduct of our troops he says: "That the attack succeeded was entirely due to the magnificent courage and endurance of the infantry officers and men. No praise could be too high for their soldierly devotion, but in commending them one must not forget the stubborn bravery of the Spanish defense."

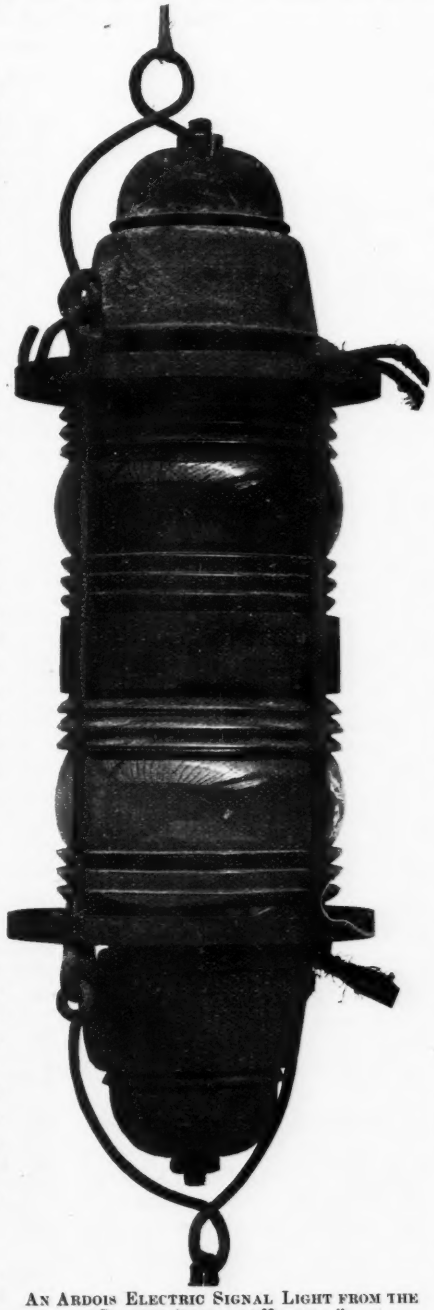
The visit of Sir E. Ashmead Ballett to Constantinople, on behalf of an English syndicate, has resulted in the issuing of an irade by the Sultan ordering the competent authorities to receive a proposal for the establishment of an electric lighting plant at Salonica. This departure is considered very important — in principle, at any rate—as hitherto it has been contrary to the Sultan's wish that any demand for electric concessions should be entertained. Such requests have formerly failed even to elicit the courtesy of a reply. Even the introduction of appliances used in the manufacture of electric light was strictly vetoed. Should the English syndicate in this instance be successful, a large field will at once be opened to electrical enterprise which has been hitherto discouraged and tabooed, presumably for religious reasons.

Experiments made by MM. Maldiney and Thouvenin brought before the Académie des Sciences, of Paris, France, prove that the Roentgen rays can promote the germination of seeds. In the case of *convolvulus arvengsis*, the seeds, when exposed to the rays for one-half an hour daily, germinated on the third day. When screened from the rays they only germinated on the sixth day.

"Any fool can make an invention, but it requires a clever man to perfect it and a perfect genius to sell it."—*Swinburne.*

The American Telephone and Telegraph Company on September 12 filed with the Secretary of New York State a certificate of increase of capital from $20,000,000 to $25,000,000.

There are 165 miles of electric street railway in Louisville, Ky.



AN ARDOIS ELECTRIC SIGNAL LIGHT FROM THE SPANISH CRUISER "VISCAYA."

AN ELECTRICAL RELIC OF THE WAR.

AN ARDOIS ELECTRIC SIGNAL FROM THE "VISCAYA" AND HOW IT WAS CAPTURED.

In the accompanying illustration is shown one of the Ardois electric signal lamps from the Spanish cruiser "Viscaya" which was destroyed with the other ships of Admiral Cervera's fleet near Santiago de Cuba, on July 3, 1898, by the American squadron.

The story of the complete destruction of the Spanish ships is now history, familiar to all Americans. The wiping out of the Spanish vessels was one of the most glorious victories ever achieved by any nation. Naturally, our navy secured what souvenirs they could after the fight. Among these were two Ardois signal lamps recovered from the "Viscaya" One of these was sent to a member of the ELECTRICAL REVIEW staff by Ensign W. K. Gise, of the battleship "Texas." The circumstances under which this souvenir was acquired are explained briefly and nautically in the following letter:

"MY DEAR ——: I sent you by express, a few days since, a little trophy from the armored cruiser 'Viscaya' that will feel more at home in your possession than it would stowed away in a cubby hole on board ship. It is the third Ardois light (from the truck down, of course) of that ship. Lieut. M. L. Bristol and I had a busy time getting it. There was a whale of a surf running, and the dinghy gave us a lively pitching and scending time. The engines of the 'Viscaya' were never stopped until the steam ran down, and before that happened her after-magazine went up, throwing the mainmast over the port quarter. The Ardois cable was fouled in the port propeller, the first and second lights being jammed hard against the boss, while the other two were drawn under water a fathom or more. These we cut adrift by lashing a knife to a boathook and cutting just after a crest had passed, hauling them up by the signal halliard stuff still made fast to them. The fourth light Bristol has, and the third comes to you full of salt stains and the very best regards of

"W. K. GISE."

ASSOCIATION OF EDISON ILLUMINATING COMPANIES.

NINETEENTH CONVENTION HELD AT SAULT STE. MARIE—A SUMMARY OF THE PROCEEDINGS—THE NEW OFFICERS.

The nineteenth convention of the Association of Edison Illuminating Companies was held at the Hotel Iroquois, Sault Ste. Marie, September 12 and 13. There was a large attendance, and the convention was a success both in respect of work done and in its social features.

The first meeting was opened promptly at 9 A. M., Monday, September 12, by President Insull. There was no formal presidential address. After roll-call, the Edison companies of Detroit, Chicago, Brooklyn, New York and Boston stated by their representatives their experience during the past year and their present practice in making rates for supply, especially low rates for long-hour use, and with particular reference to the Wright and the two-rate method of charging. The statements showed great diversions in methods, but invariable good results following readjustment in favor of long-hour consumers. The discussion was general, and was by consent reopened the next day.

Monday evening, at 7 30, Mr. W. S. Barstow described the Brooklyn transmission system in detail. He was followed by Mr. J. W. Lieb, Jr., who reported what the engineering commission, recently sent to Europe by the Edison Electric Illuminating Company of New York, consisting of Mr. Lieb, Mr. John Van Vleck, its constructing engineer, and Mr. Arthur Williams, saw there of electrical and mechanical interest. The following discussion was opened by Mr. Herbert A. Wagner, of St. Louis, and had reference largely to alternating-current practice.

On Tuesday morning Mr. Arthur Williams spoke of European practice in meters and charging systems, lamps, fixtures and details, as observed by the New York company's commission. His talk was followed by three papers on meters and metering, by Mr. E. A. Leslie and Mr. Charles S. Shepard, of New York, and Mr. Oliver J. Bushnell, of Chicago. These were replied to by Mr. Caryl D. Haskins, of the General Electric Company, and discussed very fully by Messrs. Scovil, Cleveland; Huntington, Spokane; Chandler, Sault Ste. Marie; Barstow, Brooklyn, and Ferguson, Chicago.

A special afternoon session was found necessary at which the discussion of meters and metering was continued. Two papers were read by Mr. C. C. Perry, of Indianapolis, and Mr. W. F. Kingan, of Sault Ste. Marie, on the problems of smaller stations, and a very full report, presented by Mr. Chandler, from the association's committee on Welsbach burners and acetylene gas (Messrs. Stetson, Chandler and Leslie).

The last session, held Tuesday evening, received and considered the reports of the executive committee, the committee on incandescent lamps and the lamp-testing bureau. The final business was the election of officers for the ensuing year, who are as follows:

President, R. R. Bowker, New York.

Vice-president, G. R. Stetson, New Bedford, Mass.

Treasurer, W. S. Barstow, Brooklyn.

Secretary, Wilson S. Howell, Newark, N. J. (P. O. Box 114).

Executive committee, Samuel Insull, Chicago; Charles L. Edgar, Boston, Mass.; J. W. Lieb, Jr., New York; Alex. Dow, Detroit; J. H. Vail, Philadelphia.

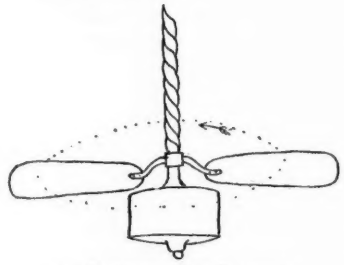
The greater part of the attendants at the convention arrived at Sault Ste. Marie by the steamer "Northwest," Sunday evening, and returned by the same steamer, leaving Wednesday afternoon. The lake trip was highly enjoyed and was one of the most pleasant features of the convention of 1898, especially as it afforded opportunity for a good deal of interchange of opinions and experiences. At Mackinaw Island, on the upward trip, the delegates and the ladies of the party were entertained by a carriage ride to points of interest, the invitation being tendered by the General Electric Company. At the "Soo," the Edison Sault company arranged carriage and steamboat excursions, and also provided canoes and Indian guides to carry the more venturesome members of the party through the rapids of the St. Mary's River. The thanks of the ladies and of the association were tendered to the Sault company and to the General Electric Company for these courtesies.

At a special meeting of the stockholders of the Consolidated Lighting Company, of Montpelier, Vt., the action of the directors in acquiring the Bolton Falls water-power was ratified. It was also voted to retire the 1,250 shares of preferred stock of the company, now in the treasury, and to increase the capital stock of the company to $91,000, by issuing 2,784 shares of common stock at a par value of $10 per share.

A CURIOUS OPTICAL ILLUSION CONNECTED WITH AN ELECTRIC FAN.

BY F. C. KENYON IN "SCIENCE."

A curious illusion connected with an ordinary two-winged pendant fan, such as are commonly employed in restaurants, barber shops, etc, attracted my attention some years ago, and lately, upon my return to the same place, was just as evident as formerly. Very much at a loss for an explanation, the phenomenon was described to one of our leading psychologists and educators, but no satisfactory explanation was obtained. Hence, it is supposed that possibly the phenomenon has not been noticed by others, and is described here for the benefit of those concerned and with the hope of drawing out similar observations by others.



AN ELECTRIC FAN ILLUSION.

The illusion consists in the fan's appearing to rotate in the opposite direction from the real one. Sitting some 30 feet away and looking at the fan, which is moving at a moderate speed, it is plainly seen to be moving in the direction opposite to that of the hands of a watch. The plane of rotation appears to be horizontal. But as one continues looking the vanes suddenly seem to move in the opposite direction and the plane of rotation to change so as to incline towards the observer. The change is under the control of the will and may be produced as readily as the illusions connected with a square within a square. A certain distance for a point of observation and also a certain speed of rotation appear to be necessary, for fans nearer the observer rotating more slowly do not produce the phenomenon which now seems to be due to the same principle of accommodation that makes a figure of a square within a square appear at one time as a hollow space and at another as a solid.

Two other illusions connected with the fan, but which may be well known to every one who has watched moving machinery, may be noted. In one the vanes, instead of rotating, seem to flap together; in the other the two iron arms appear to be continually withdrawing into and pushing out from the hanging rod.

ELECTRIC LIGHT FLASHES.

The Peninsular Electric Light and Power Company, of Houghton, Mich., has increased its capital stock from $150,000 to $200,000.

The Edison Electric Illuminating Company of Brooklyn, N. Y., has declared a regular quarterly dividend of one and one-half per cent to stock of record September 30.

Atlee H. Tracy, vice-president and treasurer of the Chestertown, Md., Electric Light Company, contemplates the erection of an ice factory with a capacity of 10 tons every 24 hours.

The Clarksdale, Miss., Water and Light Company has been incorporated by Walter Clark, E. L. Anderson, W. P. Holland, P. H. Porter and W. D. Cutrer; capital stock, $35,000.

The Jefferson Electric Light Company, of Chicago, Ill., has been incorporated by M. A. Fort, Harry Ferguson and William M. Copeland for electric light and power purposes; capital stock, $50,000.

The Pennsylvania Tube Works Company, of Pittsburgh, Pa., have completed arrangements for the establishment of a $100,000 electric plant in its great works, and the operation of the entire plant by electricity.

Suit has been entered against the Nanticoke, Pa., Electric Light Company for damages not exceeding $25,000 by Mrs. Annie Crowe, wife of the late Harry R. Crowe, who met death while turning on an incandescent light some time ago.

William S. Austin, of Morton, N. Y., has finished the construction of the big plant for the Staten Island Electric Light and Power Company, which cost $1,250,000, requiring over a year for completion. He has now entered the service of the Westinghouse Electric Company, which has sent him to Dansville, Ill., where it is about to establish a big electric plant.

The earnings of the Edison Electric Illuminating Company of New York pay at present six per cent, but at the next dividend period it is expected that the rate will be increased to seven per cent. The earnings for the last six months, it is stated, are about 13 per cent on the stock. The point is made that the growth of the business of the company is steady and improving, and that it shares to the fullest extent in every new building that is being put up in New York city.

STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK.

ANNUAL MEETING HELD AT MANHATTAN BEACH, SEPTEMBER 13 AND 14—WHAT WAS DONE—OFFICERS ELECTED FOR THE ENSUING YEAR.

A most successful meeting of the Street Railway Association of the State of New York was held Tuesday and Wednesday of last week at the Manhattan Beach Hotel. It was felt by many that this state convention, coming soon after the great national gathering of street railway men at Boston, would not be an interesting nor enthusiastic one, but the unity and closeness of interests of the great network of street railways of this state seem to involve so many specific questions, which are pertinent solely to the local organizations, that the gathering was large and representative. The seashore surroundings at the Manhattan Beach Hotel were at their height of attractiveness, and perhaps did much to create interest.

The first session of the convention, after the meeting of the executive committee, occurred at 10 A. M. The calling of the roll was followed by an address by President G. Tracy Rogers, of Binghamton. Mr. Rogers welcomed the gentlemen to the convention and then referred in a fitting way to the recent death of Hon. Edmund O'Connor, who had been for the past three years the attorney for the association. Mr. Rogers then made the following remark, which is worthy of repetition: "The Street Railway Association of the State of New York is larger, stronger and more representative than ever before, and is now recognized as an important factor in the operation of the immense business interests which it represents." Comment was then made on the excellent work which had been done at Albany in the way of bringing proper street railway facts and arguments before the legislature. Reference was made to the unusual progress within the past year, even under adverse circumstances, including the war with Spain, in the development of rapid transit, and Mr. Rogers thought the development in the city of Brooklyn, N. Y., was particularly noteworthy, and that the present development of Brooklyn was in a large measure due to the business sagacity and excellent management of its several surface railroads. In speaking of the condition of rapid transit in the city of New York, Mr. Rogers referred to the fact that during the present year 54 miles of trackage had been constructed and put in operation and that rapid track construction was one of the features in railway history worthy of great commendation, adding that New York would soon be furnished with a system of transportation to be envied by other localities. He thought that the cable system had served its purpose well and was now a thing of the past; that it was a worthy step between the horse and electricity.

Business reports from the executive committee and from the treasurer were then discussed and the reading of papers on practical street railway subjects was begun, soon to be interrupted by the noon recess. At 3 P. M. the reading of papers and an open discussion of topics brought before the association was taken up. These

MR. G. TRACY ROGERS, OF BINGHAMTON, N. Y., RE-ELECTED PRESIDENT STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK.

proceedings were followed by the nomination of officers. The election resulted in practically the same gentlemen acting as last year, with the exception of Mr. E. J. Nicoll's withdrawal from the office of second vice-president, to be succeeded by Mr. Albert L. Johnson, of the Nassau Electric Company, of Brooklyn. The following are the officers for the coming year: G. Tracy Rogers, president; W. Caryl Ely, first vice-president; Albert L. Johnson, second vice-president; Henry A. Robinson, secretary and treasurer.

On Tuesday evening a special display for the association was given of Pain's fireworks exhibition, and at nine o'clock the same evening the annual banquet was held. Hon. Tom L. Johnson acted as toastmaster and the following gentlemen responded to these toasts: Mr. J. H. Stedman, Syracuse, "Our Host;" H. H. Vreeland, Metropolitan Street Railway Company, of New York, "Transportation in Greater New York;" Hon. A. B. Colvin, "Our Best Patrons;" Hon. Jacob A. Cantor, "The Busy Boys," and W. Caryl Ely, "Our Association." One hundred and thirty-five covers were laid for the banquet.

On Wednesday the second session of the convention was opened at 9 A.M., and the reading of papers and an open discussion of street railway matters were continued. After the session, through the kindness of the local Brooklyn committee, the conventionists were taken on trolley cars over the electric roads to the Navy Yard, and in the afternoon the gentlemen of the association enjoyed a sail through New York Harbor, up the Hudson, through Spuyten Duyvil, and again down the East River to the Battery. Herewith is given a list of papers, with titles and names of those by whom they were read:

"Signal System for Single Track Roads," H. S. Cooper, Schenectady, N. Y.

"Electric Railways as an Auxiliary to Coast Defense," William J. Clark, New York city.

"By Products at Power Station," M. M. Fenner, Predonia, N. Y.

"Individual Fare Boxes; Are They Practicable?" T. J. Nicholl, Rochester, N. Y.

"Rails—Their Construction From a Scientific Standpoint; Results of Chemical Analysis," Mr. Moxham.

"Methods of Developing New Traffic on Street Railroads," H. M. Kennedy, general passenger agent, Brooklyn, N. Y.

"Track Bonding," R. P. Brown, electrical engineer, Brooklyn, N. Y.

"Track Construction," D. F. Carver, track department, Brooklyn, N. Y.

"The Relation Between the People and the Street Railways," J. T. Little, Jr., Metropolitan Street Railway Company, New York.

One of the parlors of the Manhattan Beach Hotel was given up to the street railway exhibits, and a number of practical equipments were shown. Among them the Bibber-White Company, of Boston, showed a line of special railway overhead equipments; the Safety Third-Rail Electric Company, of New York, had a large working model of its system in operation; the Cutter Electrical Manufacturing Company, Philadelphia, showed a number of splendid specimens of their circuit-breakers, particularly adapted for street railway circuits. The Parmenter Car Fender Company, F. H. Newcomb, New York Composite Brake Shoe Company and several other manufacturing companies sent apparatus for exhibition.

Aside from the members of the association who were registered at the hotel, the following gentlemen prominent in the electrical manufacturing field were present: Mr. J. F. Stevens, president Keystone Electrical Instrument Company, Philadelphia; Messrs. Thomas Bibber and Herbert W. Smith, of the Bibber-White Company, Boston; Mr. H. B. Cutter, of the Cutter Electrical Manufacturing Company, of Philadelphia; Mr. H. B. Kirkland, of the American Circular Loom Company, New York; Messrs. J. F. Outwater and E. F. Peck; Captain Murphy, of the Safety Third-Rail Electric Company, of New York, and Mr. J. S. Speer, of the Partridge Carbon Company, Sandusky, Ohio.

Boston Street Railways.

[*From the Street Railway Journal.*]

Boston is really a city exceeding 1,000,000 inhabitants, but more than half this number live, not in Boston proper, but in some 30 suburban cities and towns within a half hour's ride from the business section.

The maximum population density of an area within 10 miles of the State House is 63,800 per square mile, and is found in the district within a half mile of the State House. From three to four miles away it is but 6,000 per square mile and from nine to ten miles but 1,300. In the whole area about 45 per cent of the entire population are living within a quarter of a mile of steam railroad suburban lines.

How valuable from a transportation standpoint is the area under investigation may be judged from the fact that 231,000,000 passengers per annum, in round numbers, were carried on its street railways alone in their last financial year, an equivalent of 633,000 passengers, or one-half the entire population, per diem. In 1885 the number of street-railway passengers in this same area was but 91,000,000. Nearly 50,000,000 passengers per annum use the steam railroads in and out of Boston, but this number is decreasing quite rapidly with electric-railway competition, the decrease in the last year alone being 7.1 per cent, and in the last four years 12.2 per cent, as against an increase of street-railway traffic in the same four years of 31.2 per cent.

"Derrah's Street Railway Guide for Eastern Massachusetts" has recently been issued by Robert H. Derrah, who is associated with the West End Street Railway Company, of Boston. The guide is very comprehensive as to the network of the many electric roads which are now in operation in Eastern Massachusetts, with the names and data of all the different systems. The booklet is well illustrated by dainty half-tones of New England scenery, and is a timely and valuable work.

ANOTHER STEAM RAILWAY ADOPTS ELECTRIC TRACTION.

THE NEW ROAD FROM TONAWANDA TO LOCKPORT, N. Y.

The most recent application of electricity to the steam railroad, superseding with faster schedule the steam locomotive and steam schedule, was made on Monday, August 15, on the branch line of the Erie Railroad, which runs from Tonawanda to Lockport, N. Y., feeding into the main line of that road. The service is of a mixed type, the passenger traffic being carried on by trolley cars and the freight service by electric locomotives.

The operating company is the Buffalo & Lockport Railway Company, of which Mr. W. Caryl Ely, ex-vice-president of the American Street Railway Association, is president, and Burt Van Horn, general manager of the Buffalo & Niagara Electric Railway Company, is manager. C. K. Marshall, superintendent of the Buffalo & Niagara Falls Electric Railway Company, will also be superintendent of the new company.

The Buffalo & Lockport Railway Company was organized in April, 1898, for the purpose of connecting the cities of Buffalo and Lockport, N. Y., by means of a first-class high-speed electric railway. It has acquired by purchase the road formerly owned by the Lock City Electric Railroad Company, consisting of five and one-half miles of first-class single track running through the principal streets of the city of Lockport, with its equipment for local business. It has also acquired by a 99-year lease the Lockport branch of the Erie Railroad from Lockport to North Tonawanda, N. Y., consisting of 13½ miles of single track from Lockport to North Tonawanda, with side tracks and switches at way stations and terminals. This road, when a part of the system of the New York, Lake Erie & Western Railroad, was operated by four steam locomotives. The schedule gave about eight trains per day between the principal stations, and a much less number for the less important places Passengers went through from Lockport to North Tonawanda, from which point they reached Buffalo or Niagara Falls

The Buffalo & Lockport Railway Company has also acquired by purchase the roads formerly owned by the Buffalo, Kenmore & Tonawanda Railway Company and by the Buffalo, Elmwood Avenue & North Tonawanda Railway Company, consisting of seven and one-half miles of single track between Buffalo and North Tonawanda, and one mile of single track within the city of Buffalo. By those tracks it makes connections with the tracks of the Buffalo Railway in the latter city. The total length of the tracks owned or leased by the company is 29 miles.

By traffic contracts with the Buffalo Railway Company and Buffalo & North Tonawanda Electric Railway this company thus provides a through line from all parts of Lockport to all parts of Buffalo, and also between Lockport and Niagara Falls. It will do all the freight, mail and express business of the Erie Railroad between Lockport and North Tonawanda, and will in many ways become a component part of the Erie system. The cars and trains between Buffalo and Lockport run direct to the main station of the Erie Railroad at North Tonawanda, and the sight of the steam and electric systems side by side at this point and doing business through the same train yard is a novel one.

Work was commenced May 17, 1898, and at midnight on Sunday, August 14, the steam service was suspended. Nothing has since occurred to mar the perfect and punctual operation of the road on the new schedule. It is already doing a heavy business.

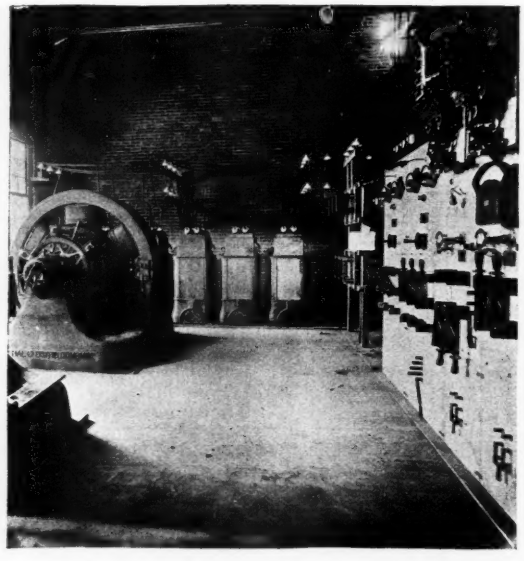


FIG. 1.—INTERIOR SUBSTATION, LOCKPORT, SHOWING AIR-BLAST TRANSFORMERS, ROTARY CONVERTERS AND SWITCHBOARD.

Power is obtained from the Niagara Falls Power Company by tapping its long-distance transmission line between Buffalo and Niagara Falls, at a point between the Falls power-house and the station of the Buffalo & Niagara Falls Electric Railway Company at Tonawanda. It is carried at a pressure of 10,500 volts alternating current over the No. 0000 bare copper wires on triple-petticoated insulators set on cedar poles, to the rotary converter substation located in a new power-house at the Lockport terminal of the old Erie branch. Here it is led into six 150-kilowatt static transformers of the air blast type, similar in construction and operation to those installed in the Niagara street power-house of the Buffalo Street Railway. In these the pressure is reduced to 350 volts, and at this pressure the current passes to two rotary converters, where it is converted into continuous current at 500 volts. The rotary converters are standard, General Electric, six-pole, 400-kilowatt, 500-revolution machines. The switchboard is of the standard panel type, and consists of one high tension panel for the high-potential transmission, two low-tension panels for the alternating-current side of the rotaries, two "K" direct current railway panels for the direct-current sides of the rotaries, and two transformer panels. The air-blast for the transformers is furnished by a blower built by the Buffalo Forge Company, and driven by a one and one half-kilowatt motor.

The switches for the high-tension current are of the quick break type, each blade being separated from its next neighbor by a marble barrier. The blades are pulled open by means of a hooked stick, the hook being inserted in an eyelet into the end of the blade. The fuses on the high-potential circuits are of the expulsion type, in which the fuse is held between two springs, so that, at the moment of fusing, the two ends, between which the arc would ordinarily spring, are instantaneously pulled apart. Each of the direct-current panels is, of course, equipped with a "K" automatic circuit-breaker.

The line is protected by General Electric lightning arresters of the short gap type, so successfully employed in the high-voltage transmission of the West, as well as on the Niagara transmission circuits. The lightning arresters are placed on the wall of the substation, where the high-potential transmission wires enter the building.

As soon as their present plant is completed another rotary converter substation will be erected at Tonawanda, taking current also from Niagara Falls.

From the starting point in Buffalo to the city limits the cars are operated by current from the Buffalo Railway Company's station. The new converter substation at Tonawanda will feed seven miles to Lockport and half way in the direction of Niagara Falls, the converters at Niagara Falls feeding half way back to Tonawanda. The arrangement will be such that the Buffalo & Lockport Railway system can give current to, or take it from, the system of the Buffalo & Niagara Falls Electric Railway. The Lockport converter station will then feed back seven miles to Lockport and supply current also to the city lines in Lockport itself.

The new rolling-stock consists of two 36-ton electric locomotives, supplied by the General Electric Company, for freight service, and 10 electric motor cars mounted on eight wheels, and built by the J. G. Brill Company, of Philadelphia, for passenger service.

The theory of handling the passenger service has been entirely changed from that in force with steam traction. Instead of long intervals between trains the cars are run on half-hour headway. This requires five cars to operate the 25 miles between Lockport and Buffalo. The speed is high. Over their own right of way the cars ran on their first trip at the rate of 50 miles per hour, including stops. The running time from Lockport to Tonawanda is 26 minutes; to Buffalo, one hour and 15 minutes. In this trip 33 minutes are spent in the city of Buffalo in a distance of six miles, where the speed has to be kept low to conform to city ordinances. Even with this drawback, however, it is expected that in the near future the running time between Buffalo and Lockport will be reduced to one hour.

The passenger and smoking combination cars are 31 feet 8 inches long over the end panels, and with platforms 4 feet 6 inches long, measure 42 feet 4 inches over the buffers. The platforms are enclosed by round-end vestibules, with openings on the diagonally opposite corners of the cars. Hinged doors, which fold back against the vestibules, completely enclose the platforms when desired. Folding gates are also provided, turning back against the outside of the vestibule. The car is divided into two compartments, one of which is used for smokers, and is separated from the remainder of the car by a partition having glass windows on each side of the sliding door. All the seats have spring cushions The inside finish of the car is cherry, with chipped glass beveled edges in the ventilators. The cars are also fitted with electric heaters, a small one under each seat, and also push buttons. All the cars of the road are mounted on Perfect trucks.

These cars are run on "T" rails at a speed that will enable them to average 45 or 50 miles per hour. Electric brakes are provided upon each axle, the disks being cast upon the wheels themselves.

The baggage and passenger combination cars are especially adapted to high-speed service. They have a passenger compartment with a seating capacity of 28 and a baggage compartment. The car body is 31 feet 8 inches long over the end panels

7 feet 8 inches wide at the sills and 8 feet wide at the widest point. The platforms are 4 feet 6 inches long. The total length over the angle-iron buffers is 37 feet 10 inches. Cars and trucks are from the shops of the Brill company, Philadelphia.

Each car is equipped with four G E–57 (52 horse power) motors and B–8 controllers. The equipment is similar to that on the new cars used on the long distance lines of the North Jersey Street Railway Company, of Newark, N. J. The weight of each car loaded is from 20 to 25 tons.

The two locomotives have been built for the purpose of handling the freight business of the road exclusively. The road being a feeder to the main Erie system, the freight traffic is considerable. To haul it, therefore, powerful locomotives were necessary, and in them the General Electric Company, which alone has had any

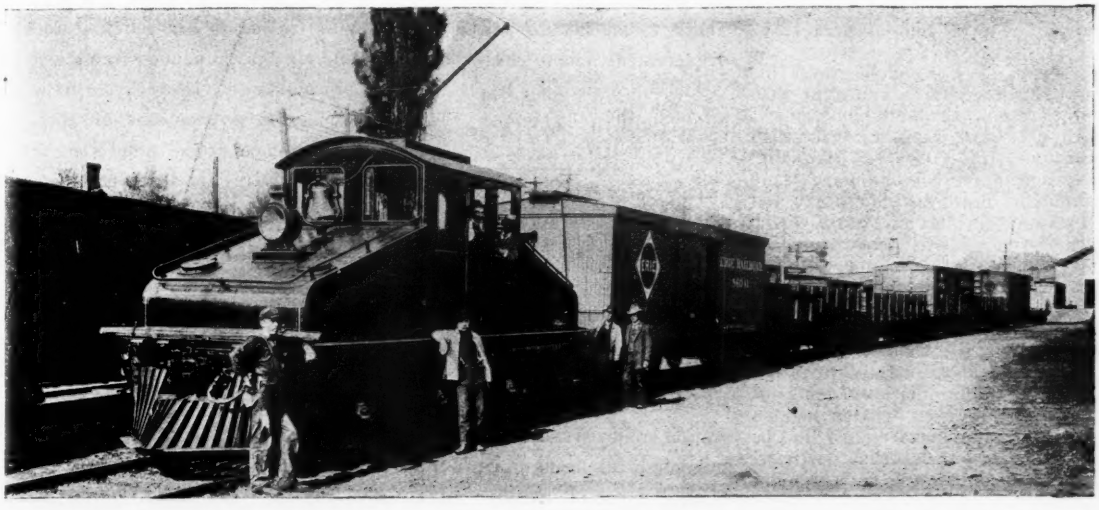


FIG. 2.—ELECTRIC LOCOMOTIVE AND TRAIN AT LOCKPORT, N. Y.

experience in building large electric locomotives, has incorporated such improvements as the actual operation of its locomotives on the Baltimore & Ohio Railroad, the New York, New Haven & Hartford Railroad and the Hoboken Shore Road has dictated.

The design follows closely that of the locomotives just mentioned, two sloping shields being placed, one on each side of a central cab, the whole carried on two swiveled trucks. The cab frame is made of 1¼-inch by 1¼-inch angles, covered with a sheathing of ⅛-inch iron.

The platform or main frame is built up of eight inch channels, running the entire length of the platform and securely riveted to cross plates at the ends directly over the center truck bearings. Heavy oak buffer beams, to which are attached draw heads and pilots, are secured to the ends of the platform The trucks have swing bolsters, supported by elliptical springs, and the truck frames are built up of forged and rolled iron, securely bolted and riveted together, the pedestals being made of cast steel. The truck proper rests on coil springs, supported by equalizing bars. The wheels are 36 inches in diameter, with steel rims and iron centers.

The locomotives are each equipped with four G E–55 motors. The drawbar pull at full speed is approximately 3,400 pounds, handling a 340-ton train at about 15 miles per hour. The motors are rated each at about 160 horse-power. As the maximum speed required is quite low, two motors are at all times connected in series.

The controller is of the K–24 type, with cut out wiring modified to fit the special requirements of the equipment in regard to speed. Outside the resistance points only two combinations of the motors are possible, the first throwing all four motors in series, and the second, or running position, placing motors No. 1 and No. 3 in series and the pair in multiple, with motors No. 2 and No. 4 similarly connected.

The locomotives are equipped with pneumatically controlled trolleys. With this arrangement it is no longer necessary for the engineer or helper to leave the cab to replace the wheel on the wire or reverse the trolley. This is effected by a handle conveniently placed over the engineer's head. The downward motion is obtained by admission of air to a cylinder, the piston of which, in moving, compresses the spring holding the pole in place when running. The upward motion is accomplished by the spring and the movement sideways by hand, both pole and handle being on a swivel plate. The view of the locomotive in Fig. 2 was taken under test at Schenectady. Here, for convenience, the current was taken from a third rail, and this explains the absence of a trolley pole.

The balance of the equipment consists of air-brakes, air whistle, bell, air-blast, sanding device, air-pump, magnetic circuit-breaker, magnetic switch, lightning arrester, electric lights, etc

The following are the principal dimensions:

Length over all.....32 feet.
Height of cab over rails.....12 feet.
Distance between center of trucks, 13 feet.
Wheel base (one truck).....6 feet.
Gauge.....4 feet 8½ inches.
Diameter of wheels.....36 inches.
Complete weight of locomotive, 36 tons.

The locomotives have already been subjected to several severe tests. They are specified to be capable of hauling trains of 300 tons' weight, exclusive of the locomotive, which, estimating the average car at 30 tons, would mean a train of 10 cars. The locomotives have already proved themselves equal to hauling as many as 28 loaded freight cars at the specified speed of 15 miles an hour.

The transformation of this line from steam to an electrically operated road marks an important step in the employment of current on the steam road. If, in its operation it successfully attains the results expected, it will conclusively prove that electricity can be economically applied to the operation of branches and feeders of steam trunk-line systems. It would be too much to expect an immediate conversion of these latter main lines from steam operation to operation by electricity, but with electric locomotives and motor cars profitably carrying on both freight and passenger traffic on their feeders, the entering wedge will be driven still further, and the ultimate result will be by so much nearer of attainment.

Considerable satisfaction has been expressed by the citizens of Lockport at the change in motive power, and great credit is due Messrs. Caryl Ely and Van Horn for the initiative which has brought about the successful installation of electricity on this road.

OUR CANADIAN LETTER.

MONTREAL, QUE.—The Montreal Street Railway will lay new rails on Craig street.

WINNEPEG, MAN.—The Western Electric Company has made a proposition to the city to establish a telephone service.

ASHCROFT, B. C.—The Water and Power Company will erect a power-house and install an electric plant.

LONDON, ONT.—An effort is being made to organize a new telephone company. A number of local capitalists are interested.

PORTAGE LA PRAIRIE, MAN.—The Central Electric Lighting Company contemplate putting in a telephone exchange in opposition to the present company.

ST. THOMAS, ONT. — The City Council has appointed a committee to report on the question of establishing a municipal electric plant for street lighting and commercial purposes.

BRANTFORD, ONT.—The Brantford Electric and Operating Company will expend the sum of $10,000 in putting in a new plant, having received the contract for street lighting for 10 years.

BRANTFORT, ONT.—The directors of the Brantford Electric Light Company have instructed their manager, Mr. Wyse, to proceed at once to purchase the necessary plant for the extension of the works.

HALIFAX, N. S.—The city electrician has submitted a report to Council showing the probable cost of lighting the city with a municipal plant. The question of installing the same will be considered at an early date.

BARRIE, ONT.—The Electric Light and Waterworks Committee have reported to the Town Council in favor of installing a municipal lighting plant, and recommending that a vote of the ratepayers be taken on a by-law to provide $35,000 for the purpose.

OTTAWA, ONT.—The Ottawa Electric Company will increase their plant at their No. 2 power-house by adding a 60-inch water-wheel and a 125-light arc generator. The Metropolitan Electric Company has been given power to do business in this city, and will shortly commence work.

ST. CATHERINES, ONT.—It is believed that the deal for the purchase of the Niagara Central Railway by an American syndicate will be concluded. Messrs. Soss, of Buffalo, and Gibbs, of New York, were here recently investigating the outlook of converting the road into a system and extending it to Port Dalhousie and Beamsville.

J. A. C.

Montreal, September 15.

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]
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CHARLES W. PRICE, - - - - - - EDITOR.
STEPHEN L. COLES, - - ASSOCIATE EDITOR.
STEPHEN H. GODDARD, ADVERTISING MANAGER.

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CARL E. KAMMEYER, REPRESENTATIVE,
1627 Monadnock Block, CHICAGO.
TELEPHONE, HARRISON, 475.

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SPECIAL NOTICE TO ADVERTISERS.
CHANGES for advertisements must be in this office by Friday noon for the following week's issue.
NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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AN ENGLISH VIEW OF AN AMERICAN INSTITUTION.

Anent some recent remarks in these columns regarding street railway transfers, London *Lightning* comments as follows:

Instead of penny fares and short stages, the Americans prefer something more like 2½d. as a unit for their tram-car fares. The greater sum will give you a longer ride, but it necessitates the extensive use of tickets enabling the passenger to leave one car and complete his journey in another without paying afresh. Though these are called transfer tickets, they are strictly "not transferable." The public does not appreciate the logic of this, and persists in regarding a transfer ticket as essentially an article for transfer. It remains for American ingenuity to stop it. One is constantly in danger of offending our transatlantic cousins by taking them as serious when they are joking, and imagining that they must be joking when they are serious. But the New York ELECTRICAL REVIEW is a "journal of scientific and electrical progress," and not intentionally a comic weekly, and therefore we suppose it must be believed when it states that (obviously to prevent the ticket being handed over and used by some one else) several tramway companies "have illustrated transfer tickets for passengers, using several styles of bearded faces for the men, and elderly and young faces for the ladies." The system appears to be an admirable one for preventing the dry-goods clerk when he meets his best girl exchanging transfers with her to save their fares home, but it does not work very smoothly with every one. In the chaste and beautiful language of our contemporary, "the conductors must do their duty, and on several occasions have punched the face of the elderly female when the fair passengers laid claim to being classed among the young women." This is indeed terrible. "In some instances they (the oldish young women) have thrown away the transfer and paid another full fare rather than suffer the humiliation of being put in the wrong class." Our maiden aunts in this country used to be liable to receive unflattering portraits. That was only once a year, and they were never compelled to negotiate their ugly valentine in public; but even this has been abolished by advancing civilization. The ELECTRICAL REVIEW says, gravely, that the question of the presentation to passengers of their portrait out of a stock of ready-mades "will require some thought before settled to the satisfaction of the passenger and conductor." In other words—

Punch, brothers, punch, punch with care,
And suit your ticket to the passenjare;
A young face slip for a maiden fair,
The elderly female's features spare:
You must sort your men by the beard and hair,
And match your ticket with the passenjare.

To complete the joke it is only wanted to announce that the system will be introduced into this country along with the American car bodies and tramway machinery. There would be a strike against the conductors with parasol handles, and an immediate end of the great Anglo-Saxon alliance.

A CHANCE FOR TELEPHONE INVENTORS.

The telephone as a means of communication on shipboard has been successfully used for some years. But the late war has taught a lesson in this as in many other things. The telephone on battle-ships and cruisers proved a failure when the vessels were in action, presumably due to the transmitter, and perhaps the receiver, having the delicate adjustment so deranged by the shock of firing that conversation became impossible. Some delays in executing orders and a good deal of confusion resulted, all going to show that the ordinary land instruments must be improved and special designs produced which will not be affected even by the tremendous shocks accompanying the firing of the big guns.

Either the adjustment devices should be automatic, or the materials used be of a character permitting so wide a range of pressure that its limits would not be passed by the displacement due to shock.

And once such an adjustment is attained, the land service could use it to advantage.

The Manhattan Railway Company, of New York city, may soon be forced, by a combination of circumstances, to install electric power on the elevated railroads, a thing it should have done years ago. In a short time, practically all the surface railways in New York city will be operated on the underground trolley system—a clean, rapid and delightful means of urban transit. With the comprehensive system of transfers now in operation in New York city, and being rapidly extended, many passengers will prefer to spend a little more time on the surface cars than to climb up and down the elevated station stairways and ride in a cinder-infested train.

Is a beard worth $10,000? This question will be decided by the Supreme Court of New York, in a suit brought by Max Meyer against a local electric company in New York city. During the recent electrical show in Madison Square Garden, Meyer was employed by the defendant company to exhibit a fluoroscope and X-ray outfit in operation. After 10 days of this work, he lost his whiskers and eyebrows as a result of too prolonged and frequent exposure to the X rays. He claims the defendant was negligent in not warning him of the danger he incurred. Hence the suit.

SIR WILLIAM CROOKES'S ADDRESS.

So far as the extracts have been published of Sir William Crookes's address to the British Association, it is something of a disappointment to note his silence on electrical matters. Perhaps the full report may change this and afford us satisfaction. It is interesting to note how this great leader of scientific research still adheres to his published statements of 30 years ago in regard to so-called "psychic phenomena," on which occasion much fun was poked at him in the journals of the day. He seems to have had the best of the fun himself, however, in his delightful personal encounters with the re-embodied spirits. To-day he goes further in his belief, it seems, and virtually announces the scientific probability of telepathy. As this wonderful achievement of thought transference from mind to mind would destroy the usefulness or need of both telegraph and telephone, it gives rise to a silent wonder if the eminent scientist has become a bear on electrics.

THE ARC LAMP.

Indications point to a large demand for arc lamps this Fall. The enclosed long-burning arc lamps now on the market are of an especially high grade, both electrically and mechanically, and their widely increasing use is doubtless largely due to recent improvements in their construction and design. The enclosed arc lamp, as now built by several manufacturers, leaves little to be desired either by the customer or central station man.

In all the advances made in electric lighting during its comparatively brief 20 years of progress, not the least striking improvement has been that shown in the arc lamp, from the open type with its eight-hour, hissing and sputtering carbons and "pumping" mechanism, to the modern enclosed arc type, whose perfect operation and long-life carbons need no comment.

Given a few months' time, New York city will have the finest electric railway system in the world. Great and rapid progress is being made.

WESTINGHOUSE—WALKER.

TWO PROMINENT ELECTRICAL COMPANIES EFFECT A COMBINATION.

It was authoritatively announced in New York city last Saturday that a combination between the Westinghouse Electric and Manufacturing Company, of Pittsburgh, and the Walker Company, of Cleveland, Ohio, had been completed. It is understood that the amalgamation was effected by an interchange of securities, the details of which have not been made public. The Westinghouse company recently issued $3,500,000 of debenture bonds, and the Walker Company $2,500,000 of first mortgage bonds.

The Walker Company is principally owned by Messrs. J. W. Hinkley, ex-Governor R. P. Flower, Anthony N. Brady and Perry Belmont. Under the new deal, the first three gentlemen will probably become directors of the Westinghouse company. Mr. August Belmont, a brother of Mr. Perry Belmont, is already a director of the Westinghouse company.

The combination will result in a cessation of patent litigation between the two companies. The Westinghouse and General Electric companies, as is known, have a patent agreement, so that all patent litigation between these three companies is now at end.

Of late the Walker Company has been doing a good business in both the railway and lighting fields, and has captured some large orders. Besides its extensive plant at Cleveland the Walker Company also has a plant at New Haven, Ct.

A Parable.

And it came to pass that after he had advertised his goods there came unto him great multitudes from all the region round about, and did buy of him. And when his competitors saw it they marveled among themselves, saying: "How be it that this man is busy, while we loaf about our doors?" And he spake unto them, saying: "Verily, verily, I say unto you, in this fast age of push and rustle, it is easier for a camel to enter the eye of a needle than for a business man to flourish without advertising." —*Printers' Ink.*

The electrical contract for the F. A. R. Baldwin office building at Allentown has been secured by the Wilkesbarre firm ot Sheperd & Rust. The building is a seven-story fire-proof structure. Shepherd & Rust's contract includes engine, dynamo, switchboard and incandescent lighting.

ELECTRIC RAILWAY NOTES.

The Newport, R. I., & Fall River, Mass., Street Railway Company is 18 miles in length and connects the cities of Newport and Fall River, serving a population of from 135,000 to 150,000.

The owners of the famous Cog road, running up Pike's Peak, have decided to change the motive power from steam to electricity. It is estimated that the cost of making the change will be about $50,000.

The Lawrence, Kas., Railway Company has been incorporated by R. W. Ludington, T. J. Sweeney, S. P. Moore and others, to build a system of electric road at Lawrence to handle passengers, freight and mail; capital stock, $250,000.

Bart. E. Linehan and Margaret Linehan have brought suit for foreclosure against the Dubuque, Iowa, Street Railway Company, commonly known as the Rhomberg line, for interest due on $37,000 in bonds, and they ask that a receiver be appointed.

Among the directors of the recently consolidated Buffalo, Tonawanda & Niagara Falls, N. Y., Electric Railroad Company, which has a capital stock of $1,500,000, is H. M. Gillett, of Bay City, Mich., a son of Samuel Gillett, of Le Roy, and the Hon. T. E. Ellsworth, of Lockport.

John B. Martin, by Attorney Colton, has sued the Baltimore Consolidated Railway Company for $10,000 damages, for the alleged illegal refusal of one of the company's transfers and ejectment from a street car, whereby the complainant, an old and feeble man, was compelled to walk several miles to his home, and being thereby prostrated by heat.

The Syracuse, N. Y., & Suburban Railroad Company's report shows as follows: Gross earnings, $1,838; operating expenses, $404; net earnings, $1,434; fixed charges, $822; net income, $612. The assets of $636,074 include $635,907, cost of road and equipment, and $167, cash on hand. The capital stock is $400,000; funded debt, $203,000; loans and bills payable, $32,462, and profit and loss (surplus), $612.

J. George Ehrhardt and wife, by attorney Wm. Colton, has brought suit in the Court of Common Pleas against the Baltimore City, Md., Passenger Railway Company, claiming $10,000 damages. Mr. and Mrs. Ehrhardt maintain a restaurant and roadhouse at Harford road and Hamilton avenue, a terminal point of the railway, and allege that the company has seriously injured their business by preventing their motormen and conductors from further patronizing them.

American Institute of Electrical Engineers.

To the Editor of Electrical Review:

In the New York *Journal*, evening edition of September 15, and morning edition of September 16, is given what purports to be a list of members of the American Institute of Electrical Engineers to whom were furnished the society pin of the so-called "kite design," which was abandoned in 1897.

One of these badges was found on the clothing of a woman killed on Staten Island. As I refused to supply any reporter with a list of members owning these pins, I deem it proper to inform you that out of the 20 names printed in the *Journal* only seven were owners of the style of pins referred to. The names were simply taken promiscuously from our catalogue of 1,100 members.

As only 264 of these originally possessed these pins, and 32 have since been returned, the impossibility of any person compiling a correct list without access to the books of this office is apparent.

RALPH W. POPE,
Secretary American Institute of Electrical Engineers.

New York, September 16.

Wall Street and the Electrical Stock Market.

The week just closed was marked by a decided improvement in speculative sentiment and by renewed purchases for long account. The statement of averages of the associated banks made a better showing than was expected.

General Electric (old) closed at 46¾ bid and 47 asked. General Electric (new) closed at 78¼ bid and 78⅜ asked. The old stock showed a gain of 3¾ points for the week. Western Union closed at 93⅝ bid and 93⅞ asked, a gain of ½ point for the week.

On the Philadelphia exchange, Electric Storage Battery closed at 36½ bid and 37½ asked.

On the Boston exchange, American Bell closed at 278 bid, and Erie Telephone closed at 73½ bid and 74 asked.

Wall Street, September 17.

At the meeting of the Board of Public Works, Jacksonville, Fla., the electric light collections for the week ending September 3 were reported to be $337.60, making the total for August, $3,351.80.

PERSONAL.

Mr. Fred A. Gilbert, president of the Boston Electric Light Company, visited New York city last week.

Col. George L. Beetle, of the Western Electric Company, Chicago, is visiting New York city for a few days.

Mr. F. B. Baum has been appointed assistant in electrical engineering at Leland Stanford, Jr., University, Palo Alto, Cal.

Mr. S. M. Hamill, general manager of the Brush Electric Company, Schenectady, N. Y., was in New York city last week.

Mr. George A. McKinlock, president of the Central Electric Company, Chicago, was among last week's out-of-town visitors to New York city.

Messrs. C. M. Morse and Samuel Ames, of the Buffalo Engineering Company, Buffalo, N. Y., spent several days of last week in New York city.

Col. Eugene Griffin, of the First Regiment of United States Volunteer Engineers, returned to New York city last week from Porto Rico, and is ill at his home in Ardsley.

Mr. J. F. Stevens, president of the Keystone Electrical Instrument Company, Philadelphia, stopped in New York several days during last week, on his return from the street railway convention at Boston, to attend the session of the state association at the Manhattan Beach Hotel.

Mr. Frank L. Perry, assistant business manager of the *Western Electrician*, Chicago, has recently been giving a series of popular lectures on electrical topics. These lectures are illustrated by lantern slides and practical working apparatus, so that the lay public is easily able to grasp many of the essential principles in the operation of the electric motor, telephone, telegraph, X rays and the many adaptations of electricity with which one is familiarized in daily life. Mr. Perry, who has had a long connection with the editorial and business management of the *Western Electrician*, has already delivered these lectures before several of the best social circles of Chicago and the West, and has received so much encouragement, that he is now arranging to extend his work.

A New Telephone Company.

The Cuyahoga Telephone Company, of Cleveland, Ohio, has been incorporated under Ohio laws, with a capital of $3,000,000, to construct and operate a local system in Cleveland.

Magnetic Blowout Circuit-Breakers.

The inherent tendency of all circuit-breaking devices to draw an arc at the last point of contact introduces a serious problem in the design of all switches and cut-out appliances. The roughening effect of the arc on the contacts destroys in a short time the usefulness of the apparatus, and, as the voltage and current increases, the difficulty is rapidly magnified. The only commercially practicable way of breaking direct-current circuits at 400 volts and above has been ascertained by exhaustive experiment to be by the use of a magnetic field, which destroys the arc at the instant of its formation, and promptly and positively opens the circuit and prevents injury to the contacts. The advantages of the use of the magnetic blowout, wherever a direct-current electric circuit is to be opened, are familiar to all users of electrical apparatus. By adding to a switch, equipped with a blowout magnet, a tripping device to open the circuit at a predetermined current, an automatic circuit-breaker is obtained which, for convenience and reliability, may be said to surpass any other form of cut-out.

The General Electric Company manufactures four different forms of magnetic blowout automatic circuit breakers for different classes of service. Each is rated by two numbers, the first indicating the lowest current that will automatically open the circuit, and the second number giving the maximum normal current carrying capacity, except in case of the form M M circuit-breaker, when the second number indicates the maximum capacity on the basis of intermittent service common in railway work. The tripping point is adjustable in any desired current, from the lowest rating to 50 per cent in excess of the maximum capacity, by adjusting the calibrating spring of the tripping armature.

The four different forms in which these circuit-breakers are made have certain radically different features, which adapt them to the special classes of service for which they are designed. All of them may, however, be used on any direct-current circuit, and, with reasonable care and attention, will operate satisfactorily under the most severe conditions. Indeed, every case of injury to the circuit-breaker may be traced to improper adjustment or neglect of some simple precaution.

In the designation of the different forms of General Electric circuit-breakers, the first letter represents the general principle of operation; the second letter is arbitrary or denotes some features of construction. For example, the first letter in the form designation of all magnetic blowout circuit-breakers is M; the second letter is arbitrary. The circuit-breakers, formerly known as K, L, Q and M, are now known as M K, M Q and M M, respectively.

The form M K circuit breakers are made for 150 to 8,000 amperes and are especially intended for severe service, such as on generator and feeder panels, where the circuit is subject to repeated and violent overloads. This circuit-breaker can be recommended for the most severe conditions met in any class of service. The parts are extra heavy, in order to withstand constant and rough use. Destructive arcing is prevented by the use of supplementary contacts placed in a strong magnetic field, and arranged to break the circuit a moment after the main contact. The transfer of the arc to the supplementary contacts and the immediate extinguishing action of the magnet has made possible the construction of effective circuit-breakers for 8,000 amperes capacity. The main contact, which is built up of leaf-spring, bears upon the main contact blocks when the breaker is closed.

All sizes of M K circuit-breakers are furnished for back connection, up to and including 800 to 1,200 amperes capacity. They can also be furnished for front connection. Circuit-breakers up to 1,200 to 2,000 amperes capacity are made when desired, with an automatic locking device operated by a handle. When the circuit-breaker is open it can be locked open by removing the handle. As the circuit-breaker can not be closed without the handle, removal of the handle prevents accidental or unauthorized closing of the contact. When the circuit-breaker is closed the handle can not be removed. The automatic locking device is especially valuable in street railway service, as it permits circuit-breakers to be left open without danger of accidental closing. All the circuit-breakers in a station may be thus placed under the exclusive control of a single operator.

For power circuits and classes of work where the conditions are less severe than in regular railway service, the General Electric Company manufactures the form M L circuit breaker for 100 to 800 amperes. Its principle of action is the same as that of the form M K, but the moving parts are somewhat lighter and differ slightly in general form. The form M L circuit-breaker is made for both front and back connections, and in two capacities—100 to 500 amperes for front or back connection, and 200 to 800 amperes for back connection only.

As in the case of the form M K, the main contacts of the form M L are laminated and connected in multiple with a secondary plug with a contact, upon which the arc is broken. The automatic locking handle is supplied on this circuit-breaker.

The form of M Q circuit-breaker is made from 15 to 100 to 175 amperes only, and is designed especially for protecting power circuits and stationary motors. In general appearance it is somewhat similar to form M L, but it has no secondary contact. The current is broken on a segmental contact similar to the contacts used in railway controllers. This form of contact has been found amply sufficient for the maximum capacity of this circuit-breaker. There is but one coil for both the tripping magnet and the magnetic blow-out. The magnetic circuit is so arranged that the arc is ruptured in its field. The positive and instant action of form M Q circuit breakers affords greater protection to electric motors than fuses, or any other form of cut-out.

The form M M circuit-breaker for 15 to 150 amperes is designed especially for street car work, and consequently its rating is based on the intermittent currents usual in railway service. It should not be used where it will have to carry its maximum rated capacity continuously. The form M M circuit-breaker is intended to supersede both the old hood switch and the fuse-box. The fuse-box, which has heretofore been the only protective device available for motor and other car equipment appliances, has usually been placed in a more or less inaccessible position beneath the car. The blowing of fuses resulted in annoying and troublesome delays, and the form M M circuit breaker was at once received with favor, as it affords perfect protection to the apparatus and can be instantly reset. It resembles a main motor switch in appearance and answers the purpose of a switch in every way, being intended for location in the same position under the hood of the car platform. It can be set to open at any current within certain ranges and can be closed and opened by hand, exactly like the old main motor switch.

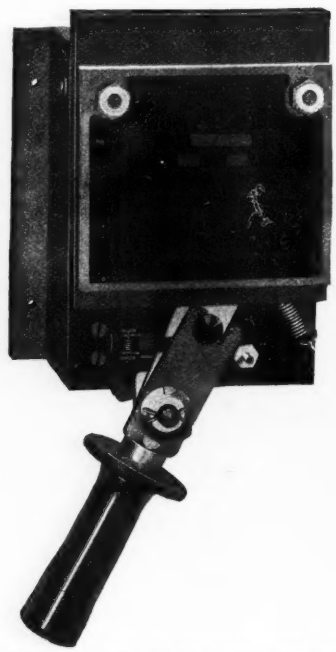

FIG. 1.—M M MAGNETIC BLOWOUT CIRCUIT-BREAKER.

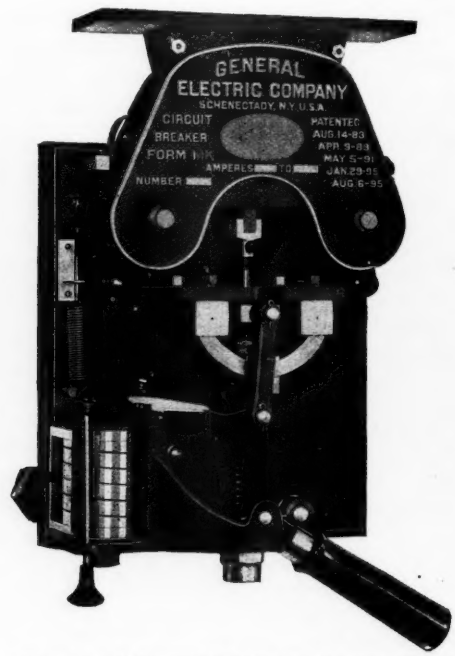

FIG. 5.—M K MAGNETIC BLOWOUT CIRCUIT-BREAKER.

The coil of the blowout magnet and the secondary or plug contacts are in multiple with the main contact. Owing to the comparatively high resistance of the secondary contacts practically no current passes through them until the main contact opens, the whole current then passes through the magnet coils and the strong magnetic field extinguishes the arc as soon as it is formed on the plug contact. The plug is not withdrawn until after the leaf contacts have left the contact blocks.

The plug, or secondary contacts, and the inside of the boxes enclosing them, should be frequently examined, and any accumulation of carbonized material removed. If the secondary contacts are not kept in good condition and properly adjusted the current will be broken on the main contacts and injury to the circuit-breaker will result. A little vaseline on the secondary contacts tends to keep them smooth and increases their life. All parts of the circuit-breaker should be kept clean.

ELECTRICAL NEWS FROM THE DAILY PAPERS.

BURGLARS UTILIZE THE TELEPHONE.

Robin Hood was considered a very clever robber, but beside the modern thief he was a guileless child, observes the Chicago *Inter-Ocean*. Your up-to-date robber uses all modern inventions and conveniences. His latest feat is to discard the revolver and the sandbag for the telephone. The police have been informed of this new wrinkle in burglars' tools, and hereafter every man caught with a telephone is likely to become an object of suspicion.

One afternoon recently, about four o'clock, H. B. Leavitt, a druggist at Hill and Wells streets, answered the telephone, and was asked to call John Olson, of 86 Hill street, just around the corner, to the telephone. The druggist dispatched his clerk to the Olson flat, and the lad soon returned, saying no one was at home. The answer was communicated to the man who was "holding the wire" at the other end of the line, and the druggist thought little of the circumstance at the time. A short time afterward Leavitt, in answering the telephone, heard a feminine voice. The woman said she would like to talk to some member of the Olson family.

"Be sure and find whether any one is at home," she said, "for it is very important."

Leavitt's clerk pounded the Olson door for several minutes, and the feminine voice thanked the druggist for his trouble when the information was imparted that surely no one was at home.

When Olson and his wife returned home late in the evening they discovered that their flat had been searched and over $100 worth of silverware, jewelry and clothing had been taken. Olson dropped in at the corner drug store to tell his woe, and then Leavitt recalled the two conversations with the persons who had been so anxious to be certain that Olson was not at home.

A CHARGED LETTER-BOX.

The Springfield, Mass., *Republican* states that a letter-box that has been hanging on the electric-light pole at the corner of Main and Worthington streets became so charged with electricity Thursday evening, that it was impossible to remove the mail at the time of the night collection. Carrier J. A. Gooche stepped up and grasped the lock in his familiar way, and got a severe shock along his left arm. Thinking the difficulty was with his hand, he attempted to take hold with the right, but the result was the same. The mail had to be left until morning. This is the second box in that city to become charged to any degree.

A FAITH HEALER USES THE TELEPHONE.

A Chicago dispatch to the New York *Journal* says that Dr. John Alexander Dowie, he of faith-healing reputation, is taking advantage of modern appliances and raising the dead by telephone.

At least that is the tale told by Louis M. Lindskog, a blacksmith and wagon maker, on Ashland avenue.

Charles Metzel and Silas Jacklin, two employés of Lindskog, fell from a derrick at the shop, No. 4601 Ashland avenue, 60 feet, recently, and Lindskog says that Jacklin was instantly killed.

Lindskog telephoned for Dowie.

Dowie was busy at his temple, so he had no time to answer calls in person.

Instead, he sent Lindskog a prayer over the telephone, and Lindskog, laying his hands on the dead Jacklin, repeated the prayer, and Jacklin, it is alleged, arose and walked.

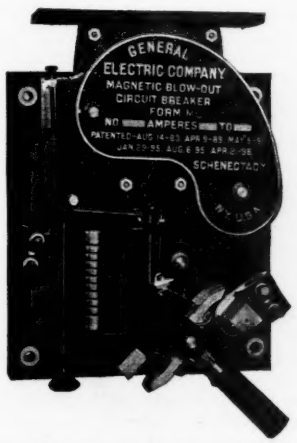

FIG. 2.—M L MAGNETIC BLOWOUT CIRCUIT-BREAKER, FRONT CONNECTED.

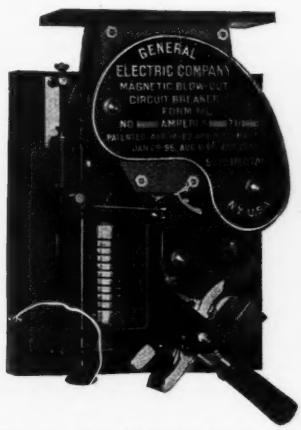

FIG. 3.—M L MAGNETIC BLOWOUT CIRCUIT-BREAKER, BACK CONNECTED.

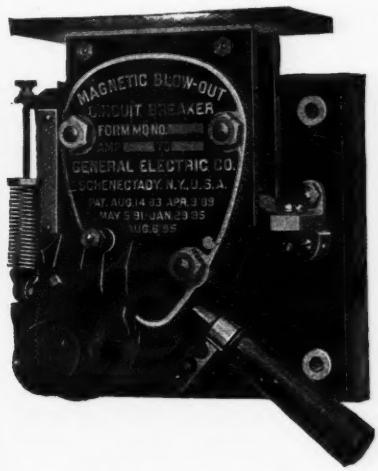

FIG. 4.—M Q MAGNETIC BLOWOUT CIRCUIT-BREAKER.

Roebling's New Rubber-Covered Wire Plant.

A new plant for the manufacture of rubber-insulated wires and cables is now in full operation at the extensive works of John A. Roebling's Sons Company, Trenton, N. J. This firm has been in the electrical wire business for a number of years, and has, up to the present, made every variety of articles in this line excepting rubber insulated wire. It has supplied the "Crescent" wire to the trade, but labored under the difficulty of not having a plant exclusively its own, the manufactures of which could carry the name of "Roebling," so potent as a selling agent in itself, on account of the high standing of the concern and the uniform excellence of all of its products.

The Roeblings have turned out a very large share of the wire equipment of street railways, telephone companies, electric light and power companies, in the United States. Their works are probably the largest of their kind in existence. The new factory is equipped with the latest and best machinery for manipulating the rubber and applying it to the wires and cables. It is contained in a large three-story brick building, 60 feet by 160 feet, with storage and drying rooms, etc. The railway and water communications are directly at hand for easy shipments of products. The large rolling and wire mills, with the various other appliances for preparing wire for insulation, are conveniently located with reference to the rubber-insulating plant. Any variety of rubber covered conductor, from the smallest wire to the heaviest stranded lead-incased cable, is manufactured, and all the needs of the trade will be promptly supplied.

Answers on Electric Transmission.

TO THE EDITOR OF ELECTRICAL REVIEW:

In answer to Mr. John H. Noble's questions, published in your paper of August 31, concerning my method of transmission, I may state that, if the midway transformer, having primary and secondary coils of equal length, were omitted the effect would be that much less electrical energy would be transmitted to the distant receiving station, and there would be no saving of expense, but a loss. Similar remarks apply to the use of a continuous-current transformer when continuous currents are transmitted over great distances.

Suppose it is by other methods commercially impracticable to send alternating currents over distances greater than 50 miles because of either the increased diameter and consequent cost of the copper line wire, or the great difficulty of insulation if we attempt to transmit electric currents of more than 2,500 volts. At 50 miles from the transmitting station, instead of having motors or lamps, if we have a midway transformer, with primary and secondary coils of equal length, we pass the current by induction from the primary into the secondary coil of this transformer. The secondary coil may be regarded as a generator, transmitting alternating currents over a second length of 50 miles. The primary coil of the transformer passes nearly all of its electrical energy into the secondary. Suppose a dynamo of 100 horse-power is at the transmitting station, the secondary coil of the midway transformer will then virtually be a generator for the second circuit. Something less than 100 horse-power will be forwarded in this second circuit, and the voltage will be something less than 25,000. The secondary coil, regarded as a generator, is already 50 miles from the station containing the dynamo, and transmits a current of not much lower voltage than what it receives. The result will be that the electrical energy will be sent 100 miles with small loss.

Let the distance over which it is possible to send currents by other methods be however great, I propose to nearly double it by my method when using a midway transformer, and to send it over distances between two and three times as great as the greatest possible by other methods than mine by using two transformers having primary and secondary coils of equal length, the first of these transformers being situated at about one-third and the second at about two-thirds of the distance between the transmitting and the receiving stations JAMES ASHER.

Dunnville, Ont., September 12.

TRACK BONDING.

REPORT OF A COMMITTEE PRESENTED TO THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK, MANHATTAN BEACH, SEPTEMBER 13, 1898, BY R. P. BROWN AND G. E. CHAPIN, BROOKLYN HEIGHTS RAILROAD COMPANY.

The tracks of the Brooklyn Heights Railroad system were originally bonded with the familiar supplementary wires, the section of the rail being such that it was difficult to use any other method. This wire, as well as the branches leading to the rails, was tinned so as to make good contact with the earth, and large copper plates, also tinned, were placed in the damp soil or water in the vicinity of the power house. These plates soon became corroded and coated with insulating substances, and were practically of no value in returning the return current, so return feeder wires were run out to make frequent taps to the supplementary wire. As the traffic of the road increased, the cost of this return copper became a serious matter, and when it became necessary to relay the tracks in 1895, the question of bonding received careful consideration. The rails were practically carrying no current, and it was decided that the new construction of nine-inch girder rails would increase considerably the conductivity of the return circuit, provided they were properly bonded.

To take full advantage of the large amount of metal for the track, a bond of high conductivity, the shortest possible length, and low contact resistance was required. At that time no bond meeting all these conditions could be found, and one was designed by the engineers of the company. As the joints were suspended, there was sufficient space between the ties for supplying bonds underneath the base of the rail, and arrangements were accordingly made to make contacts at that point. The bond decided upon was of cast-copper, the full width of the base of the rail, and the connection between bond and rail was obtained by surface contact, about 12 square inches of surface being covered by the bond on the end of each rail. This contact came within three-quarters of an inch of the end of the rail, and the connecting metal was left the same size, five inches wide and one-sixth of an inch in thickness, the bond being a trifle thicker at the point of contact. The connecting piece of metal was curved so as to allow for expansion. To secure good connection, a re-enforcing plate of cast-iron was placed underneath the area of contact, and the bond pressed firmly against the rail by two and one-half-inch bolts passing through the base of the rail. No machine work is done on those bonds other than girdling the contact face. The scale was removed from the rail where the bond was to be applied by grinding with a portable emery-wheel. This was not a very costly operation, as the rails were arranged with bases uppermost as they were unloaded from the lighter, and no rehandling was necessary.

To prevent corrosion, a shallow groove was formed around the contact space, and an attempt made to seal the bond water-tight by forcing into this groove a non-hardening pitch, heated until very fluid. Owing to the fact that the groove was necessarily very shallow, the bond-plate being only three-sixteenths of an inch thick, this sealing was unsuccessful in practice; but owing to the large area of contact, if rust had formed in the joint it has in no way affected the conductivity, as recent tests show these bonds to be practically of the same resistance as when first installed, three years ago.

The cost of these bonds was not greater than that of the 0000 bond going completely around the fish-plate, and having two or three times the electrical resistance of this connection. The difficulty of attaching a bond underneath the base of the rail, however, was considerable, and careful supervision was necessary to have the work performed in a proper manner. This trouble lead to further investigations, with the result that a bond electrically brazed to the rail was adopted the following year. This bond was somewhat cheaper than the plate-bond, and good work was more easily obtained on account of the better chance of inspection. The use of such a bond had been discussed the two previous years, but was not developed on account of a doubt whether the contact could be made large enough to prevent heating when considerable current was flowing that might give rise to thermo-electric effects between the copper and the iron.

A sample of copper brazed to steel was secured, and after careful tests it was found that the contact between copper and steel was of negligible resistance, as compared with the resistance of the copper strip. Owing to patent difficulties it was impossible to make any arrangements with the firm supplying this sample for the use of the bond that year, but a series of experiments demonstrated the possibility of doing the brazing by a process developed by the electricians of the company. There was not sufficient time to obtain special apparatus for doing this work, so the electrical current needed was taken from the railway circuit. To obtain the low voltage required, the brazing apparatus was connected in series with a generator between the circuit-breaker and the negative bus of the station. The voltage of this dynamo was raised high enough to overcome the added resistance, and the generator run in multiple with the others in the power-house. Several brazing contacts were in series, so that the resistance could be kept as uniform as possible, and, owing to the large output of the stations, the variations in the load were slight and very little was given the regulation of the dynamos used in the welding circuit. Transformers have since been obtained for doing this work, and the brazed bond has been adopted as the standard on all the heavy lines of the system. As no portable brazing apparatus had been obtained, the bond is made in two parts and brazed on the rail before they are removed from the yard.

The shape of the bond depends on whether it is placed on the web of the rail so as to come underneath the fish-plate, or, as they are now applied on the base and upper flange of the rail outside of the joint plate. All forms of the bond, however, are made up of 10 or 12 leaves of one-sixty-fourth-inch soft copper, the carrying portion of the bond being one and three-fourths inches wide, and the brazed contact having an area of about one square inch. Soft spelter, with suitable flux, is used in brazing the copper to the steel rail. The bond is divided longitudinally into three parts so as to give greater flexibility. When the rails are in position the ends of these bond-leaves are interlaced and fastened together by rivets and also by solder. The length of the bond between center of contacts is five inches, and its cross-section is equal to 350,000 centimetres.

All the brazing of the several thousand bonds now installed has been done with a makeshift device, employing processes developed entirely by the electricians of the company. License under the patents of General Payne, of Elmira, and the Thomson Welding Company has been obtained to guard against any claim of infringement.

On account of the great number of miles of track that are rapidly being relaid, it was found to be impossible to braze bonds for all the rails with the inadequate means at hand, so the lighter lines have been bonded with the short bonds of the "horse-shoe" type placed underneath the fish-plates. The holes for these bonds are drilled by the makers of the rail, and they are reamed out with emery-paper to remove the rust that may have formed during shipment. If care is used in compressing the terminal of those bonds, there is no necessity for drilling or reaming of holes on the ground, as any slight irregularity in the drilling fills up when the soft copper is thoroughly upset. The horse-shoe bonds are three and one-fourth inches in length of 0000 cross-section, and have three-fourths-inch diameter terminals. As a measure of safety, as well as to lower the resistance of the joints, all rails are double-bonded whether the brazed or horse-shoe bonds are used.

Curved-rail switches and other special work are often difficult to bond satisfactorily in the yard, and the joint plates are of such section that the bond can not be placed underneath. In such work long bonds going round the fish-plates are used. On account of the excessive wear on special work, the joints are particularly liable to loosen, so that the bond must be extremely flexible.

The 0000 bonds are used on this work, and, to keep the conductivity the same as the street rail, both sides of the special work are cross-bonded, and the circuit re-enforced by running 500,000-circular-mil wires jointing these cross-connections, the number of wires used depending on the current density of the track in each section. The straight track is cross-connected every 750 feet Those cross-connections are made of 500,000 circular mil wire, fastened to the rail with a terminal for the contact similar to that of the plate bond mentioned before. These terminals have about six square inches of contact, and are soldered to the rail. The terminals have a cast-iron re-enforcement, and are bolted to the web of the rail, so that no mechanical strain can come on the soldered joints. This same terminal is used to connect the return wires in the track adjacent to the power-house to the negative bus.

It has been found that if a simple bond is used it should be placed at the center of the web of the rail, if sufficient contact can be obtained at that point. If contact is made at either the base or upper flange, the length of the circuit is increased by the height of the rail; and, in case of the nine-inch girder, the increased resistance is equal to one-half of the total resistance of the bond itself. On account of the greater depth of metal, it would seem advisable, when two bonds are used, to apply one on the top of the upper flange of the rail and the other on the base. Solid joints are very apt to break if the joint plates become loosened to any extent, and are, consequently, never used on special work. Contrary to the former practice of tinning the bonds and supplementary wire, the bonds and their exposed copper surface are carefully coated with an insulating paint, so that if there is any flow of the current off the track to the surrounding soil it must leave from the steel and not from the copper. This prevents the bonds being destroyed by electrolysis or other corrosive action.

The Falk cast-welded joints make the best possible electrical connection, and if care is used in the installation conductivity almost equal to the continuous rail can be obtained. The new electrically welded rail joint, made by the Johnson Electric Company, promises to be equally good.

To guard against imperfect workmanship a system of testing bonds has been practiced. Usually only the joints on one line of rail are tested, though in sections of high-current density, as in the vicinity of power-houses, the resistance of each joint is obtained. The test is a simple comparison of the fall of

potential across the joint and on a measured portion of an unbroken rail. Two Weston millivoltmeters, with scales ranging from .001 to .3 of a volt, are used, the readings being taken simultaneously. Contact is obtained by pressing hardened steel points on the surface of the rails. These points are set in wooden blocks and placed six inches apart if used on the joints, and two feet apart for test on solid rail. The distance on the rail is taken for two feet instead of one foot on account of the small amount of current flow in the rail on some of the lighter lines. These testing terminals are provided with handles of convenient length, so that the person using them can stand upright and apply the necessary pressure with one foot. Two men can test joints very rapidly with this outfit. The current density of some of the rails was too low to give reliable reading with these instruments, so a portable resistance was arranged on a wagon and the necessary current readily obtained from the trolley wire. This resistance allowed about 300 amperes to flow from the line to the rail, and as it could be very quickly applied, rendered it a comparatively easy matter to test the joints in any section of the city.

Although the bonds are less than six inches, that length was selected for the distance between terminals of the voltmeter used in testing joints, because it gives a convenient fraction to subtract from the length of each rail in arriving at the total resistance in line of track. The drop on those six inches was considered as increasing the length of the rail by an amount proportionate to the drop in the rail itself. From this percentage that the rail of any line approached the conductivity of the solid steel rail could be easily determined.

The following results were obtained from different joints :

FALK JOINT.

Drop.			Per Cent of Conductivity.
1 ft. of rail.	1 ft. of joint.		
.00215	.00355	30 feet of rail	98
		60 feet of rail	99
DOUBLE-BRAZED BOND.			
1 ft. of rail.	1 ft. of joint.		
.00725	.00758	30 feet of rail	99.8
		60 feet of rail	99.9
JOHNSON BOND.			
2 ft. of rail.	6 in. of joint.		
.00364	.00342	30 feet of rail	95.6
		60 feet of rail	97.8
PLATE BOND.			
2 ft. of rail.	6 in. of joint.		
.0109	.0233	30 feet of rail	89
		60 feet of rail	94

It will be seen by the foregoing that it is a comparatively easy matter to get a conductivity of over 90 per cent of a continuous steel rail. As high as 600 amperes can be safely carried on any of the bonds mentioned, and the cost of double bonding in a satisfactory manner should not exceed 75 cents per joint. The conductivity of steel varies with the amount of carbon in its composition, but, generally speaking, it is about one-eighth of the conductivity of commercial copper. Bearing these facts in mind, it will be readily seen that it is much cheaper to make the return circuit wholly of well bonded steel rails, supplementing the track in the vicinity of the power-house with worn-out rails carefully bonded.

TRACK CONSTRUCTION.

READ BEFORE THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK, MANHATTAN BEACH, SEPTEMBER 13, 1898, BY D. F. CARVER.

In the development of street surface railways, from their operation by animal power to their operation by cable or by electric power, the experiences of those concerned have been many and varied.

Although some of the experiences gained may have been through unpleasantness, it is of great credit to those engaged that they have succeeded in developing in so short a time, such an enormous industry from so small a beginning.

The greater service and durability exacted of the track-work and roadway, the first exaction due to the heavier loads on wheels, the increased machinery and the comfort of the passengers, and other exactions caused by many local officials for the comfort and safety of vehicles, have made it imperative that the general construction of track-work should be reduced to a science.

It is at the present time more essential to give an expression of opinion as to those appliances in sight which give the best results, and not to refer to those which have been found wanting and have been abandoned.

The essential feature of good track construction and good pavement is a good foundation. In a majority of cases this exists naturally at the depth at which ties are laid. If the natural foundation is not suitable, it can be made so by the use of broken stone or gravel.

The ties should be of the best quality of yellow pine ties, sawed four sides, and of a size sufficient to give a bearing on foundation of not less than four and one-half square feet per tie. A very excellent and economical spacing has been found to be 24 ties to a 60-foot rail.

All ties should be thoroughly tamped near the rail and the joint ties tamped throughout their lengths. The dirt under the base of the rail should also be thoroughly tamped, otherwise there will be a settlement which will allow the rail stones to be forced down.

The rail used should be of a hard steel and of a section that will give it great stiffness. The tread should be either level or, as is becoming common practice, should bevel, so that the wheels will have a bearing for the width of the tread. This latter arrangement gives greater contact for traction and stoppages, and also causes less damage to wheels that are skidded in an emergency stop.

The web of the wheel should be as nearly as possible beneath the center of the tread, so that the resultant of the forces of weight and lateral motion of the wheel shall fall within the width of the base.

As the lightest section of nine-inch rail is more than amply strong to stand the strain of carriage, provided, of course, that every tie has a first-class bearing, it has been found desirable to roll the web down to the thinnest section possible and accept the small losses due to rails splitting along the web from the tension caused by the very unequal distribution of metal. The breakage above referred to has been found to be, throughout a year's work, about one-fourth of one per cent of rail laid.

The problem of the rail joint has been a very trying one, but it is fast approaching a successful and satisfactory solution, the essential features of which are either a welded joint, which makes a rail practically one continuous mass, or the mechanical joint, which avails of the bearing surfaces beneath the head and tram and beneath the base, and of the upper surface of the base.

This method of construction will, in time, force the track out of line, and where the line is curved to any extent will push the curve out of line, and also in renewing any portion of the track in warm weather, it will be found almost invariably impossible to put in new pieces of the same size as the old removed, because the great compression strain closes up the opening. Still, with all these objections, the added length of life of joints gained is of decided advantage.

With the girder rail sections in block paved streets it is absolutely necessary to use a rail filler. We have experimented with the burnt brick, which was found to crumble badly under heavy wagon traffic and it has been abandoned. In its place are used hemlock planks, which give the best results on the investment.

In paving up the street the portions outside the outside rail and between the tracks should be paved and thoroughly rammed before the sections between the rails are paved. This prevents the crowning of the stones between rails from forcing the track out of gauge.

A bed of concrete between ties has been tried to prevent the paving blocks from sinking, but such experience as the writer has had with this construction has not been very satisfactory, and as its first cost is great, and also as the interest on this extra investment is, in many cases, greatly in excess of the maintenance charges which it is intended to prevent, he is led to doubt very greatly its utility.

BOSTON STREET RAILWAY CONVENTION NOTES.

Barney & Smith Car Company, Dayton, Ohio, were well represented; as were the Taunton Locomotive Manufacturing Company, of Taunton. This company was represented by their agents, Messrs. Wendell & McDuffee.

The McGuire Manufacturing Company, Chicago, sent a number of splendid specimens of their trucks for street-railway work and also trucks such as are now in use on the Brooklyn Elevated Railroad and Brooklyn Bridge. Mr. Hubbard represented the company in a dignified and quiet manner, and was welcomed by many prominent men in the street railway field.

The well known Peckham Motor Truck and Wheel Company, said to be the largest truck manufacturers in the world, with offices in Boston, Chicago and several continental cities, were represented by President Peckham, Mr. E. G. Long and the Chicago agent, Mr. J. A. Hanna; his associate, Mr. Gray; the eastern agent, Mr. Field, and several other gentlemen.

The Crosby Steam Gage and Valve Company, Boston, had an exhibit in the further end of the hall, completely filled with all the various forms of Crosby steam gages and valves. The display was one of the largest of the kind and attracted much attention. Engineer Robert Perie, northeast sales manager S. G. Read and Charles M. Gibbs represented the company during the convention.

The Parmenter car fender was shown. The fender is dropped by a knee lever and is brought back into its normal position by the reverse movement. The wheel guard is entirely automatic. One of the features of the fender is its compactness and lightness, which permits of its being easily handled. This form of fender is now in use on the Metropolitan Railway, at Washington, the Capitol Traction Company, Washington, and the Hartford, Manchester & Rockville Tramway Company.

The elaborate arrangements made by the J. G. Brill Company, car builders, Philadelphia, were much appreciated by the visiting railway men. In addition to many forms of trucks and car equipments, the company had sent to Boston several double freight cars loaded with the best specimens of completed cars from the factories at Philadelphia. It was worthy of note that the splendid progress made in recent years in constructing street cars was more in evidence at this convention than perhaps at any preceding. Mr. John A. Brill was present in person, and also half a dozen other gentlemen of the company, all well known in the street railway field. Aside from the elaborate exposition made at Mechanics' Hall, the company had headquarters at their parlors in the Brunswick Hotel, where generous hospitality was dispensed.

EQUIPMENT AND MAINTENANCE OF ELECTRIC CARS.

ABSTRACT OF A PAPER READ BEFORE THE AMERICAN STREET RAILWAY ASSOCIATION, BOSTON, SEPTEMBER, 7, 1898, BY M. S. HOPKINS.

In the selection of the electrical equipment the main point is to secure equipment of ample capacity and proper design for the service required. In a railway motor, the mechanical and electrical features which influence its maintenance should receive very careful consideration. The bearings should be large and lubricated by oil from below and cup grease from above, and so designed that the drip from the bearings will fall outside of frame. The armature should be so constructed as to permit the shaft being pushed out without disturbing the commutator and winding.

I am glad to note that the importance of light weight and slow peripheral speed of armature has been recognized in the recent design of railway motors. The inertia of flywheel capacity of the armature should be the smallest possible, consistent with the work required. Engineers differ as to the best method of suspension. From a theoretical standpoint, the cradle or side-bar suspension has the lead. The dead weight is largely removed from axle, thereby eliminating to some extent the hammer blow on rail joints, decreasing the wear on axle brasses and securing the better alignment of gears; yet, in practice, the nose suspension is still preferred by the writer, as the car starts more smoothly—the weight of motor on spring supports overcoming the jerk and quiver so common in other methods of support. The specifications for railway motors, as drawn up by leading manufacturers of to day, amount to practically nothing, and would suggest that the purchaser of motors in his specifications clearly define the rating heat limit and efficiency.

The series parallel controller is in most respects a satisfactory device, the chief objection being the narrow range of speed on running notches. Specifications for resistance should provide that the last two points of resistance be of sufficient capacity to allow of their continued use as running notches, especially where cars are operated in city service.

There are several types of magazine fuse boxes or cut-outs and single cut-outs using a special fuse, which possesses a number of points of merit. Without going into detail, it is the opinion of the writer that under average conditions the standard magnetic blowout fuse box, using a link fuse, is preferable.

Each car should be equipped with a thoroughly reliable lightning arrester. The points to be noted in selecting this device are as follows: The kicking coil should always be installed; the air gap should be as small as possible; there should be a positive and quick device for interrupting the current after discharge, and one which will not be injured by discharge; there should be a non-inductive resistance in the main circuit which will limit the flow of current and thereby prevent the opening of the circuit-breaker at the station when several arresters operate at the same time.

One of the most puzzling problems brought before the manager to-day is the amount which should be expended in the maintenance of old equipment before it should be replaced by new. To the average master mechanic this would seem a simple problem of making a careful estimate of the difference in cost of maintenance of the old and new equipment, due consideration being given to the interest on money invested in new equipment and its increased efficiency. Still, after the master mechanic has conclusively shown that by putting in new equipment a marked saving can be made in cost of operation, the manager has to consider the financial condition of the property, the advisability of increasing the investment, the possibility of doing so, and whether there are not other departments of the road where a greater saving can be made by increasing the investment. One should go slow in putting in new equipment, as new apparatus may at first seem to be void of the main defects inherent in old equipment, yet when put in operation other defects occur which, under the varying conditions, may prove even more disastrous than the old.

The cost of maintaining equipment depends on various complex conditions, some of which are beyond control of the manager, and others for which he should be directly responsible. Heavy grades, numerous railway crossings, sharp curves, dirty and unpaved streets, imperfect and poorly constructed equipment, long and severe Winters, all affect cost of maintenance unfavorably and are beyond control of the manager. But the character of men who operate the cars, the manner of operation, the way in which repairs are made, the character of men engaged in repairs, and the material used, are the controllable elements, and in most instances the chief features affecting maintenance.

Generally one of the following three methods are used for daily inspection of car equipment; namely, inspection of cars for each trip, inspection of equipment at night by motor inspectors, inspection of equipment during the day by motor inspectors and repair men.

In regard to the first case, that of the trip inspection, I would say that in the present degree of perfection attained by manufacturers of railway equipment, trip inspection should not be necessary, and, excepting on interurban lines operating at high speed over long runs, is of doubtful value. It is expensive, requiring the services of an inspector, who is necessarily a man of some ability, for each line of cars. The period of time for making this inspection is necessarily very short, and the entire time is taken up in mere inspection, little or no opportunity being afforded in which to make repairs.

In regard to night inspection, the experience of the writer has been such as to absolutely condemn such a method as expensive, slovenly and unsatisfactory. It is impossible to make a thorough inspection of cars at night, no matter how well lighted the car house may be, and the efficiency of the work done by the men is very far below that of the work during the day. Therefore, when local conditions will admit, inspection of cars during the day seems by far the most advantageous.

We will assume a car-house station from which 25 or more cars are operated. There is usually one general foreman in charge of this station. His duties are chiefly those of the transportation department, but he should be a man thoroughly conversant with the usual trouble which may occur in the operation of the equipment, and know how to direct minor repairs. It would be better, of course, if he were able to personally superintend the actual work of repairs, but it is usually very difficult to find men who are good mechanics and likewise efficient in the transportation department.

For making inspection and running repairs such as should be made in car houses, it is a safe rule to have one man to seven cars. It is important, however, to have in all car stations a man known as chief inspector of that division, who is thoroughly conversant with practical electrical and mechanical matters. This chief inspector should have under his care for inspection and repairs seven cars, and also have direction and supervision of the other two repair men who care for the remaining 18 cars.

It is important that the responsibility for the proper repair of cars be definitely located, as nothing is so demoralizing to the force of motor inspectors as to have a case of trouble arise and not be able to trace the responsibility at once to the proper source.

The duties of these men should be to make a daily inspection of every car assigned to them, starting first with their motors, examining the grease cups, the brushes, cleaning the motors, examining connections, etc. They should remove the covers from their controllers about once in three days and oil the cams very lightly with vaseline or grease, remove any blisters which may have appeared on the contact points and carefully examine the adjustment of contact fingers. Too much emphasis can not be given to the inspection of all brake rigging, and very thorough inspection should be made daily from the brake-handle to the brake-shoe, and the brakes tried by inspectors before the car is placed in service. A broken brake-chain or worn out shoe, a broken brake-clutch or a broken brake pin are things that should never occur through neglect, and if an accident of this kind does occur, the cause should be immediately traced and the responsibility located. Economy in maintenance should never be exercised at the expense of absolute safety, and brake-chains, pins and shoes should be discarded long before the danger point is reached.

The general public forms its opinion of maintenance of equipment by the little things on the interior of the car, such as a screw loose in the back, a broken strip on the floor, loose register pulley, broken hand-strap, broken glass, rattling glass and hundreds of other little things which make the fittings of a car body. Repair men and inspectors should be so trained that in passing through the car on their inspection, they should note any little thing of this kind at once, and the rule should be that they stop and repair it at once, for if allowed to wait till some other time the repair is usually neglected entirely.

The actual repair work done by these inspectors should be all work possible to be done without the use of machine tools, or which, if done by them, will not require the loss of the

car from service for a period of more than two hours.

If during this inspection the motor inspector discovers trouble which is beyond his ability to repair, he should fill out a repair slip and send the case with the slip at once to the repair shop, stating the nature of the required repair, assuming that the repair shop is run as a separate department from that of the car barn. If the nature of the trouble is such as not to immediately incapacitate the car for use, but which requires the services of the repair shop department, he should fill out the blank as above noted, and send same to the foreman of repair shop, but this notice to the repair shop foreman should in no way release the motor inspector from the responsibility of the successful operation of the car. If the repair shop foreman is unable to take the car off the road at once, owing to press of work, it is the duty of the motor inspector to watch continuously the development of this trouble, and if at any time he thinks it has so advanced that the car is not safe for successful operation, he should leave the car out of service, and so notify repair shop foreman. If the latter is still unable to receive the car at the shop, he should then make a personal examination of car and assume responsibility for its further operation.

The question as to how often car equipment should be taken to the shops for a general inspection and overhauling, and to what tests the electric equipment should be given at the time of inspection, are subjects upon which electrical engineers widely differ. Considering the average conditions, and assuming that the equipment is in good condition, it is the opinion of the writer that the taking of cars to shops once every six months should maintain the equipment in good condition and assure its efficient operation.

Elaborate systems for the periodical testing of insulation on railway equipment seem to be growing in favor with some electrical engineers, but the practical value of these elaborate tests is not fully demonstrated. Experience has shown that tests of this kind are very misleading and frequently cause the tearing down of equipment which, under ordinary conditions and had no tests been made, would have continued in service for a long time.

Judging from my own experience, it is neither necessary nor advisable to test periodically the insulation on the equipment, but to make such tests only in cases where the motors are not working properly. The proper training of motor inspectors as to the little points about railway equipment, which clearly indicate trouble with motor, will locate in nearly all cases trouble due to weak insulation, so that it can be remedied before any serious damage has resulted to any other part of the equipment.

All armatures and field coils repaired should be carefully tested as to resistance and insulation to ground, and on all armatures having coils repaired, new commutator put on or commutator turned, the resistance between commutator bars should be very carefully measured. This should be done preferably with a portable whetstone bridge testing set capable of showing clearly a variation in resistance of 0.001 ohm. This is one of the most important tests to be made in the care of railway equipment, as more burnouts of armatures are caused by the slight, short circuiting of coils, due to the bridging over of insulation between bars by solder, acid or copper turnings under the leads, than from any other cause. These defects can be located only by a test of this kind. A bad joint or any mistake in connecting up the leads will be detected at once before any damage has been done. For testing insulation to ground I consider a first-class magneto of 10,000 ohms resistance all that is necessary.

THE LARGEST DYNAMO IN THE WORLD.

BY S. H. SHORT.

The rapid development of electric power for various purposes has made a demand for larger and larger units in the generating stations where this power is produced. A few years ago generators of 100 to 200-kilowatts capacity were considered enormous machines. There soon appeared, however, direct-driven generators of 750 kilowatts, to be used in large railway plants in such cities as Chicago, Boston, St. Louis and Brooklyn. At the World's Fair, in 1893, the first 1,500-kilowatt generator made its appearance in the Intramural Railway station. This machine was then considered a monster. This unit was soon adopted for many of the large street railway stations, notably in Chicago and Boston, and finally machines of 1,600 kilowatts were placed in the Kent avenue station in Brooklyn. Still later, Louisville, Ky., purchased a 2,200-kilowatt generator. The Metropolitan Street Railway Company, of New York, has recently placed an order for a number of 2,500 kilowatt alternating machines, and but a few months ago the Boston Elevated Railway Company, which succeeded the West End Street Railway Company of that city, gave to the Walker Company, of Cleveland, the order for a 3,000-kilowatt machine.

All of these large machines are made to run at the very slow speed of from 75 to 80 revolutions per minute. It is true that the alternating-current machines built for the Cataract Construction Company at Niagara Falls have an output of 5,000 horse-power each, while the monster ordered by the Boston Elevated Railway Company has an output of but 4,000 horse power. Nevertheless the 4,000-horse-power machine being built by the Walker Company is much larger than the alternators in use in the Niagara Falls power-house, as the speed of the Boston machine is 75 revolutions per minute, while that of the Niagara machines is somewhere in the neighborhood of 300 revolutions per minute.

If the Boston machine were run at the high speed of the Niagara machines, its output would be something over three times that of the latter, or about 16,000 horse-power.

As the construction of this 4,000-horse-power generator marks an era in the development of dynamo-electric machines, it may be interesting to electrical engineers and those using electrical apparatus to know its dimensions and general design.

The total weight of the complete machine is 250,000 pounds.

The frame is made of cast steel and is circular in form, the diameter over all being 21 feet 7 inches.

The weight of the frame alone, without the field magnet cores for magnet spools, is 50,000 pounds, or 25 tons.

To the inside of the magnetic ring or frame are bolted 24 laminated steel magnet cores or pole-pieces, the total weight of which is 30,000 pounds, or 15 tons. The inside diameter of the bore of these pole-pieces, completed, is 15 feet 6 inches.

The magnet cores are each provided with magnet spools, wound with shunt and series coils, in the usual way. The pole-pieces are arranged to hold the magnet spools in place, and each core is bolted by four three-inch bolts to the inner surface of the magnet frame.

The magnet frame is divided in halves, on a horizontal plane, and is mounted upon the foundation plates in such a manner, that the whole frame may be made to slide lengthwise of the engine shaft, far enough to uncover the armature windings or to allow the individual magnet cores or field spools to be removed without separating the magnet frame.

The armature spider of this machine is an interesting part of its construction. It is made in halves, like the hub of a flywheel, to be bolted together upon the shaft of the engine after it reaches its destination. If it had been made in one piece, no railway car could be found large enough to ship it from Cleveland to Boston. The armature hub weighs, complete, 40,000 pounds, or 20 tons, and has an outside diameter, before the laminations are in place, of 13 feet. After the engine is upon its foundation, in Boston, this armature spider will be mounted upon the engine shaft, which is itself 37 inches in diameter. The laminations, which form the armature core, the total weight of which is 30,000 pounds, or 15 tons, will then be built upon the periphery of the armature spider.

The slotting in the armature laminations will register accurately and provide, when completed, 594 slots. The insulation and windings will then be fitted into the slots and connected with the commutator.

The commutator itself is made up of 1,188 bars, and is 105 inches in diameter. It is divided into halves for the purpose of shipment and ease of handling, and will be placed upon an extension of the armature hub after the latter is secured to the engine shaft.

The great flywheel of the engine will be bolted directly to the armature hub near its periphery, in order that the regulating force of the wheel shall not be transmitted wholly through the shaft of the engine. This will relieve the armature shaft and its keys from the enormous strain to which they would otherwise be subjected.

The machine has been most carefully designed and an unusually large factor of safety provided for every part subjected to mechanical or electrical strain. Because of this the machine will be able to take twice its normal load for short periods of time without injury, and to carry a 50 per cent overload for several hours.

The greatest care has been taken to secure from the generator a higher percentage of efficiency than has thus far been attained in units of large size.

There seems to be no limit to the capacity to which these large generators can be carried. The development that has taken place thus far is an interesting study in view of what must ultimately come when we are compelled to provide means for the transmission of power for those large schemes of propulsion which are awaiting the application of electricity in place of steam.

What will be the limit to the size of machines required when our main line steam railways are operated by electricity?

ADVANCE INFORMATION

New Electric Railways.

SAGINAW, MICH.—The Saginaw & Frankenmith Railroad Company has been incorporated to construct an electric line between the two places, a distance of 14 miles.

HATBORO, PA.—The Hatboro & Horsham Electric Railway Company has been formed to construct a trolley line between the two towns.

DOYLESTOWN, PA.—The Newtown Electric Street Railway Company has been granted a franchise to construct an electric line through this place.

BARABOO, WIS.—A company recently formed to construct an electric railway between Devil's Lake and the Dells by way of this town has petitioned the Council for a franchise. The company includes H. Cottrell, of Milwaukee; F. J. Butler, of California, and Herman Grotophorst, of Baraboo.

HARTFORD, CT.—The new company that has been formed to build and operate a trolley line from Springfield to Suffield, Windsor Locks and Rainbow has among its list of directors the Hon. Noble E. Pierce and F. L Fairbanks, of Bristol and Thomas Welch, of Southington, the latter being a young lawyer in the office of Holcomb & Pierce, at Southington.

YONKERS, N. Y.—It is stated that the Union Railway Company has contracted to purchase the Yonkers Electric Railway. Passengers will be carried from any part of Mount Vernon to any part of Yonkers for a single fare of five cents. As soon as permission is granted to lay tracks across the Harlem railroad, and the line in New Rochelle is completed, through cars will be run from Yonkers to New Rochelle for a single fare of five cents.

BOWLING GREEN, OHIO — Engineers have commenced work on the route for the extension of the electric road, and it is the plan, if the right of way can be obtained, to connect this place with Jerry City. An effort will be made to secure the old Coldwater roadbed from Mungen.

SOUTH BEND, IND.—The Indiana Electric Company is making preparations to extend its West Franklin street line from the curve near the Highland Park bridge to Indiana avenue, and thence west to the city limits.

FOREST CITY, PA.—The Traction Company has begun the work of extending its line from the southern limit of the borough along Main street. A trestle will be built over the creek on South Main street, and a force of men is at work on the approaches. It is expected that cars will be running by the latter part of October.

SAN FRANCISCO, CAL.—It is said that the Market Street Railway Company, of this city, is quietly moving to obtain permission to string electric wires along that street, substituting electricity for cable as motive power.

Electric Light and Power.

ALBANY, N. Y.—The Mill Point Power Company has been incorporated, to operate in Amsterdam, Fonda, Fultonville, Johnstown, Gloversville and the surrounding towns in Montgomery and Fulton counties; capital, $80,000; directors, John Marsh, of San Francisco; John Begley, of Gloversville; Hugh J. Brady, of Cooperstown; Paul T. Brady, Robert E. Drake and Charles M. Warner, of Syracuse, and Walter H. Bunn, of New York.

JERSEY CITY, N. J.—The Consolidated Incandescent Light Company has been incorporated; capital, $500,000; incorporators, Thomas F. Bedle, Pierre F. Cook and Francis H. McGee, Jersey City.

GONZALES, TEX.—The Santa Anna Water-Power Company has been incorporated; capital stock, $5,000; incorporators, R. S. Dilworth, F. R. Starr, Jr., and C. T. Rather.

WINONA, TENN.—The Winona Ice, Electric Light and Water Company has been organized, with an authorized capital of $100,000. The stockholders are E. R. Blackston, Mrs. L. J. Turner, D. B. Turner, C. S. Harris, William H. Witty, John K. Armstrong, A. A. Green, L. Small, R. Sanderson, James T. Lay, J. C. Wadsworth, O. M. Turner, D. S. Bachman.

FREDERICKSBURG, VA.—Capt. T. McCracken, chairman of the light committee, may be addressed concerning electric lighting plant.

DELAWARE, OHIO—E. E. Naylor, City Clerk, may be addressed concerning lighting the city with gas or electricity.

HOUMA, LA —The Town Council, at a special meeting, granted Messrs. Wilson & Jastremski, proprietors of the Houma Ice Factory, a franchise for 15 years to operate an electric light and power plant.

CROWLEY, LA.—The Town Council met and accepted the waterworks and light plant from the contractors. A recent test of the plant showed that the contract had been fully complied with and the town of Crowley given a plant that the people can be proud of, at a cost of nearly $37,000.

HONEOYE FALLS, N. Y.—The electric light plant between this place and Lima is fast nearing completion, and the company expect to furnish patrons by the twentieth of this month. Nearly all the inside wiring in the village is put in, and Lima is furnished and using lights.

RICHLAND CENTER, WIS.—The City Council is contemplating the erection of an electric plant for the purpose of lighting the streets of this city, and a committee has been appointed to carry on an investigation of plans to that end.

JACKSON, MISS.—A stock company, composed of local capitalists, is being organized to establish and maintain an electric light and ice plant. The capital of the company will be $8,000.

A Pocket Electric Light.

A new pocket electric light has recently been placed on the market by James S. Barron & Company, of 24–30 Hudson street, New York city. The lamp is intended for use among chemicals and other explosive material, where explosions frequently occur by the careless handling of oil lamps and matches.

A POCKET ELECTRIC LIGHT.

It is made in such a shape, the size being nine by one and one-half inches, as to admit of being easily carried in the pocket, and when wanted for use can readily be lighted by simply pressing a ring at the top of the lamp. The lamp contains three batteries, with a capacity of over three volts, and at the end is placed a magnifying lens for the purpose of distributing the light.

Without renewal, the batteries have a life of, approximately, from 6,000 to 8,000 lights, and, when exhausted, separate batteries can be purchased without the necessity of getting the entire lamp.

One of the advantages of the lamp is the absence of wires, and it also contains no chemicals to spill, making it absolutely safe, even when used among such explosive material as gunpowder.

The lamp should prove of material benefit to engineers, electricians and those who are generally working among explosive material.

TRADE NOTES.

Messrs. Walker & Kepler, the electric supply house, 531 Chestnut street, Philadelphia, are placing on the market several thousand snap switches of various standard makes, which they are offering at special prices.

The Le Valley Vitae Carbon Brush Company, 39 41 Cortlandt street, New York, were well represented at Boston, during the week of the Street Railway Convention, by Mr. E. J. Prehm. This company manufactures the Le Valley commutator brushes, which are claimed to be a perfect product, and to be absolutely self lubricating, non sparking and non cutting. The factory of this company is at White Plains, N. Y.

Anent the world-famous cruise of the "Oregon" from the waters of the Pacific to the Atlantic, the Peerless Rubber Manufacturing Company, of New York, have distributed gratuitously a striking picture in colors of the ship, and the statement that the "Peerless" ship made the run of more than 13,000 continuous miles and went into action at Santiago without the necessity of undergoing repairs; that she was fitted in all her joints with "Rainbow" packing and "Eclipse" gaskets; and that her piston and valve rods were packed with "Peerless" packing. The attractive picture is worthy of a frame in any engineer's office.

"Pegamoid," a wonderful preparation, is being widely brought to the notice of the electrical industries of America. The compound is something that is worthy of consideration by all those who are identified with electrical manufacturing interests or railroads and power houses. The material is put on like paint and adheres evenly, not cracking by extremes of temperature, and is anti-corrosive. This makes it particularly valuable for roofs of power-houses, cars, etc., and for use on cylinder-heads and bright parts of engines, as the aluminum skin is not affected by lubricating oil, so that for use about dynamos and steam machinery it is peculiarly effective.

The "Columbia" incandescent lamp, which has been for so many years a splendid standard for electric light experts, is being manufactured this Fall in larger quantities than ever to meet the booming trade of the season. The Columbia Incandescent Lamp Company, of St. Louis, asserts that an impartial trial can not fail to convince that the "Columbia" are far more uniform in candle-power, voltage and efficiency, and will maintain their candle-power to a higher degree throughout their life, at the same time giving a satisfactory average life, than any other lamp in the market. This statement is made because, since the establishment of the "Columbia" factories in St. Louis, in 1889, efforts have been unceasing to make the "Columbia" lamp the most perfect production for electric incandescent light, and the statement is often heard that buildings with "Columbia" light are perfectly lighted.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED SEPTEMBER 13, 1898.

610,524 Electrically-controlled valve for hydraulic presses; W. B. Cleveland, Cleveland, Ohio—An hydraulic press, a valve controlling the liquid under the plunger, and an electro-magnet connected to said valve to control the same, and having a source of electricity for its coil, and having the contact-terminals of said coil respectively upon the stationary and moving element of the press.

610,539 Electric clock; F. Hope-Jones, London, England—An electrically-wound regulator, a secondary clock, the hands of which are moved through the agency of an electric current, means in the regulator for making the electric circuit, which operates the secondary clock, and means in the secondary for opening said circuit.

610,620 Commutator brush-holder; W. K. Bassford, Jr., Bound Brook, N. J.—A commutator, an electric conducting-block, a pusher for driving the block against the commutator, and an automatic device for retaining the block from the commutator against the action of the pusher.

610,704 Telephone system; W. W. Dean, St. Louis, Mo.—Consists of a spring-switch for controlling the association of the telephone with the telephone line, a movable telephone support having a separable engagement with the spring-switch, which support serves, when depressed, to actuate said switch to open the circuit through the telephone a stop for directly engaging the spring switch to hold the same stationary independently of the telephone support, and electro-magnetic means for bringing the stop into direct engagement with the spring-switch, whereby the operation of the spring-switch is prevented when said support is relieved of its weight and permitted to rise.

610 705 Brush for electrical machines; J. W. Dickey, New York, N. Y.—A brush for electrical machines, consisting of successive layers of wire gauze formed into the desired shape, and then compacted by pressure.

610,706 Phonograph; T. A. Edison, Llewellyn Park, N. J.—In a phonograph, the combination of a rotating support adapted to receive phonogram cylinders of different diameters, a recording or reproducing device carried by an arm adjustable for cylinders of different diameters, and means independent of the bank for supporting said arm in different positions to positively sustain the recording or reproducing device for engagement with cylinders of different diameters.

610,712 Apparatus for starting and controlling electric motors; T. W. Kloman, New York, N. Y.—An electric motor having its field magnet coil or coils connected permanently in circuit with a main source of current supply, in combination with an independent source of current supply provided with means for connecting it in circuit with the armature of the motor and varying the current relations therethrough, in accordance with the load put upon it, the arrangement being such that the independent source of current supply is never electrically connected with the main source.

610,767 Magnetic separator; Ambrose Monell, Munhall, Pa.—A wheeled truck or barrow having a receptacle, a drum arranged to be rotated by the wheels of the truck or barrow and carrying electro-magnets, and switches for said magnets arranged to be actuated by rotation of drum.

INCANDESCENT LAMPS.

The Beacon Lamp Company, New Brunswick, N. J., are offering the newest "Beacon" incandescent lamps with a guarantee, at usual efficiencies, to average a maintenance of their initial candle-power for over 300 hours. In addition the Beacon Lamp Company say that the average life of these lamps is more than 600 hours.

Thomas A. Edison, Jr., reports heavy Fall sales of his well known "Edison, Jr." incandescent lamp. The continued demand for this lamp has made it necessary for him to establish several new agencies and he now has branches distributed generally throughout the country, from which he is receiving many large orders. The main offices of Mr. Thomas A. Edison, Jr., are 27 Williams street, New York, and the following are the addresses of the agents for the "Edison, Jr." lamp: Illinois Electric Company, Chicago; Austin Electrical Supply Company, Austin, Tex.; Geo. H. Gill, 60 State street, Boston; Owen Burns, 405 Adams Building, San Francisco; J. Boyd Dexter, Annapolis, Md.; Wm. Gibbs Bain, 748 Drexel Building, Philadelphia; Thompson & Company, St. Paul, Minn.; Old Dominion Electric Company, Norfolk, Va.

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TO CONTRACTORS.

Sealed proposals for furnishing the materials and performing the labor required and necessary for installing an Engine and Generator at Buffalo, N. Y., for Buffalo State Hospital, may be sent by mail or delivered in person up to 3 P. M. on the 6th day of October, 1898, to Joseph P. Dudley, President of the Board of Managers, Buffalo, N. Y., at which time the Board will receive and open all proposals.

Drawings and specifications may be consulted and blank forms of proposal obtained at the Hospital, or at the office of I. G. Perry, Architect, in the Capitol at Albany, N. Y.

Each bid must be enclosed in an envelope, sealed and addressed to Joseph P. Dudley, President of the Board of Managers Buffalo, N. Y., and endorsed, "Proposal for Installing Engine and Generator."

ELIAS S. HAWLEY,
Secretary Board of Managers.

PATENTS TRADE-MARKS COPYRIGHTS
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Counsellor in Patent Causes.
Some time connected with the late Benjamin Butterworth, before he retired from practice to assume the office of Commissioner of Patents.
Prompt attention given to all matters before the Patent Office, and applications for patents prepared here at Washington from sketches, photos, or models, in a manner to give highest satisfaction and with less expense than you will incur elsewhere. Write and convince yourself of this fact. As an attorney at Washington is indispensable you can save the expense of having two by communicating directly with me.
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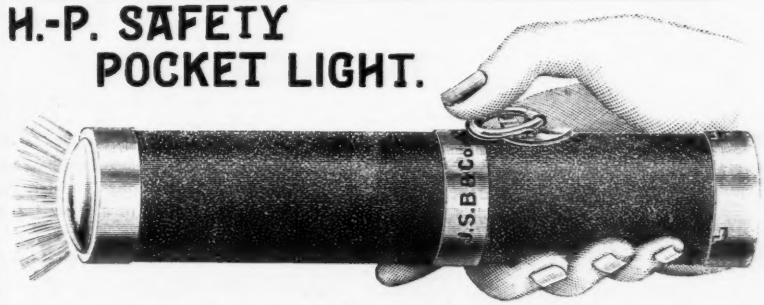

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Kindred.... ...Interests

The General Electric Company, through its New York office, has issued a handsome binder in which to preserve the numerous bulletins issued by the company describing its latest apparatus in all lines of electrical progress.

The Warren Electric and Specialty Company, of Warren, Ohio, have issued a calendar blotter for September, which carries on its face some genuine "pointers with a point." One pointer is this: "Science has discovered microbes in kisses. This shows the microbe is not such a fool as he looks."

The Electric Appliance Company, Chicago, have just printed a special catalogue devoted exclusively to "Anchor" switches. This catalogue is fully up to date, embodying all the recent improvements that have been made in snap switches. The catalogue is supplied with a special discount sheet to the trade, and altogether makes a valuable little reference book on switches. It may be had for the asking.

The Julius Andrae & Sons Company, Milwaukee, Wis., have just issued a revised price list of Andrae incandescent lamps. A copy will be mailed to any one interested upon request. The new telephone catalogue will be ready for distribution within a fortnight. The demand for "O. K." and "1900" dry batteries is continuing at a healthy growth in Milwaukee and vicinity. Both these popular batteries are handled by the Julius Andrae & Sons Company.

The Albany Day Line treated its employés very handsomely recently by giving them a free ride to the battle-ships at Tompkinsville. The elegant boats of this company get in from Albany at 6 P. M. Immediately after landing the passengers at the pier, the boats made a tour of the battle-ships off Staten Island. General Passenger Agent Hubbard invited a number of his railroad friends to accompany him. Several trips were made during the week the ships were to be seen.

Every one has heard something of the wonderful fruit district of the Niagara Peninsula, and has promised that some day they would visit the great garden spot of Canada. The management of the Hamilton, Grimsby & Beamsville Electric Railway, of Hamilton, Ont., which runs through the district, has just issued a handsomely illustrated booklet describing the whole peninsula and telling a good deal of the wonders of the fruit harvest there. It will be sent free to any one writing for it.

For distribution at the Trans-Mississippi Exposition at Omaha, the General Electric Company issued from its press a neat little brochure very fully illustrated. As all the machinery used to light the grounds and buildings of the exhibition, and to supply the power, was furnished by the General Electric Company, the types of apparatus shown in the book enable the visitor readily to identify each type as he meets with it in the exhibit or in any part of the working plant itself. Many thousands of these little books have been printed, and the demand for them at the exhibition has kept the company's presses fully occupied.

The Western Electric Company, Chicago and New York, has recently issued Bulletin No. 7–RS, giving detailed description of the Russell & Officer automatic switch. The object of this switch is to allow the turning on or off of one or any number of lights from two or more points by means of push buttons. Its advantages are that a large number of lights can be controlled by means of a push-button switch without having to bring the main wire supplying these lights to the switch itself, a No. 16 Brown & Sharpe gauge wire answering the purpose for any size of switch; that a group of lights may be controlled from any number of points independently of each other, and that lights in large rooms or buildings may be controlled from a central point. This switch is also designed as an underload or overload switch when provided with a special relay. The magnets operating the switch depend upon the electric light circuit, and there are no batteries to get out of order or cause trouble. This switch is manufactured by the Western Electric Company, and further details can be obtained by writing for a copy of Bulletin 7–RS.

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